ControlLogix Digital I/O Modules

Allen-Bradley

Input Modules 1756-IA8D, 1756-IA16, 1756-IA16I, 1756-IA32, 1756-IB16, 1756-IB16D, 1756-IB16I, 1756-IB32, 1756-IC16, 1756-IG16, 1756-IH16I, 1756-IM16I, 1756-IN16, 1756-IV16, 1756-IV32
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User Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
SHOCK HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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Introduction

This release of this document contains updated information and specifications for ControlLogix digital I/O modules.

Documentation Revision

This document supersedes the 'C' version of 1756-UM058-EN-P. The 'D' version was not available to the public.

New Information

New information is marked by change bars in the side column, as shown to the right.

Section	Module Information
Chapter 2 and page 29	Information for scheduling I/O modules on the ControlNet network and setting up I/O modules to trigger event-based tasks.
Chapter 3 and page 143	1756-IA32 module - Features and module-specific information
Chapter 3 and page 161	1756-IG16 module - Features and module-specific information
Chapter 3 and page 200	1756-OB8I module - Features and module-specific information
Chapter 3 and page 212	1756-OB16IS module - Features and module-specific information
Chapter 3 and page 221	1756-OG16 module - Features and module-specific information
Chapter 3 and page 233	1756-OV32E module - Features and module-specific information
Chapter 3	Using electronic keying with examples of Exact Match, Compatible, and Disabled Keying.
Chapter 7	New digital I/O specifications.
Appendix F	Requirements for firmware updates for Major Revision 3.*x*.
Appendix G	Updated information on Interface Modules (IFMs) and pre-wired cables that are available with digital I/O modules.

Notes:

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Introduction

This manual describes how to install, configure, and troubleshoot your ControlLogix digital I/O modules. There is also a complete listing of digital input and output modules, including specifications and wiring diagrams, in Chapter 7.

Who Should Use This Manual

You must be able to program and operate a Rockwell Automation ControlLogix controller to efficiently use your digital I/O module. If you need additional information, refer to the related documentation listed below.

Additional Resources

The following table lists related ControlLogix products and documentation.

Related Documentation

Cat. No.	Resource
1756-A4, 1756-A7, 1756-A10, 1756-A13, 1756-A17	ControlLogix Chassis, Series B Installation Instructions, publication 1756-IN080
1756-A5XT, 1756-A4LXT, 1756-A7LXT	ControlLogix-XT Chassis Installation Instructions, publication 1756-IN637
1756-PA72, 1756-PB72, 1756-PA75, 1756-PB75, 1756-PH75, 1756-PC75	ControlLogix Power Supplies Installation Instructions, publication 1756-IN613
1756-PAXT, 1756-PBXT	ControlLogix-XT Power Supplies Installation Instructions, publication 1756-IN639
1756-IF16, 1756-IF6CIS, 1756-IF6I, 1756-IF8, 1756-IR6I, 1756-IT6I, 1756-IT6I2, 1756-OF4, 1756-OF6CI, 1756-OF6VI, 1756-OF8	ControlLogix Analog I/O Modules User Manual, publication 1756-UM009
1756-CNB, 1756-CNBR	ControlNet Modules in Logix5000 Control Systems, publication CNET-UM001
1756-DNB	DeviceNet Modules in Logix5000 Control Systems User Manual, publication DNET-UM004
1756-DHRIO	ControlLogix Data Highway Plus-Remote I/O Communication Interface Module User Manual, publication 1756-UM514
1756-DHRIOXT	ControlLogix-XT Data Highway Plus-Remote I/O Communication Interface Module Installation Instructions, publication 1756-IN638
1756-ENBT, 1769-ENET	EtherNet/IP Modules in Logix5000 Control Systems User Manual, publication ENET-UM001
1756-L*x*	ControlLogix Selection Guide, publication 1756-SG001

Related Documentation

1756-L*x*	ControlLogix System User Manual, publication 1756-UM001
1756-L*x*, 1769-L*x*, 1789-L*x*, PowerFlex 700S	Logix5000 Controllers Common Procedures Programming Manual, publication 1756-PM001
1756-L*x*, 1769-L*x*, 1789-L*x*, PowerFlex 700S	Logix5000 Controllers General Instructions Reference Manual, publication 1756-RM003

If you need more information on these products, contact your local Rockwell Automation distributor or sales office. The documentation listed in the Related Documentation table is available at http://www.rockwellautomation.com/literature/.

What Are ControlLogix Digital I/O Modules?

Introduction

This chapter provides an overview of the ControlLogix digital I/O modules to explain to you how they operate.

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ControlLogix digital I/O modules are input/output modules that provide On/Off detection and actuation. By using the producer/consumer network model, digital I/O modules can produce information when needed while providing additional system functions.

Available Features

The table lists several features available on ControlLogix digital I/O modules.

ControlLogix Digital I/O Module Features

Feature	Description
Removal and Insertion Under Power (RIUP)	You can remove and insert modules and removable terminal blocks (RTB) while power is applied.
Producer/consumer communication	This communication is an intelligent data exchange between modules and other system devices in which each module produces data without first being polled.
System time stamp of data	A 64-bit system clock places a time stamp on the transfer of data between the module and its owner-controller within the local chassis.
Module level fault reporting and field-side diagnostic detection	Fault and diagnostic detection capabilities that provide you the information necessary to most effectively and efficiently use your module and troubleshoot your application.
Agency Certification	Class 1, Division 2, agency certification for any application that requires approval.

I/O Module in the ControlLogix System

ControlLogix modules mount in a ControlLogix chassis and use a removable terminal block (RTB) or a Bulletin 1492 Interface Module[1] cable to connect all field-side wiring.

Before you install and use your module, you should:

- install and ground a 1756 chassis and power supply. To install these products, refer to the publications listed in Additional Resources on page 11.
- order and receive an RTB or IFM and its components for your application.

IMPORTANT RTBs and IFMs are not included with your module purchase. See page 101 for RTBs and page 287 for IFMs.

Types of ControlLogix Digital I/O Modules

Cat. No.	Description	Page
1756-IA8D	79…132V AC 8-point diagnostic input module	134
1756-IA16	74…132V AC 16-point input module	137
1756-IA16I	79…132V AC 16-point isolated input module	140
1756-IA32	74…132V AC 32-point input module	143
1756-IB16	10…31.2V DC 16-point input module	146
1756-IB16D	10…30V DC diagnostic input module	149
1756-IB16I	10…30V DC 16-point isolated input module	152
1756-IB32	10…31.2V DC 32-point input module	155
1756-IC16	30…60V DC 16-point input module	158
1756-IG16	Transitor-transitor logic (TTL) input module	161
1756-IH16I	90…146V DC 16-point isolated input module	164
1756-IM16I	159…265V AC 16-point isolated input module	167
1756-IN16	10…30V AC 16-point input module	170
1756-IV16	10…30V DC 16-point sourcing current input module	173
1756-IV32	10…30V DC 32-point sourcing current input module	176
1756-OA8	74…265V AC 8-point output module	179
1756-OA8D	74…132V AC 8-point diagnostic output module	182
1756-OA8E	74…132V AC 8-point e-fused output module	185
1756-OA16	74... 265V AC 16-point output module	188
1756-OA16I	74…265V AC 16-point isolated output module	191
1756-OB8	10…30V DC 8-point output module	194

[1] The ControlLogix system has been agency certified using only the ControlLogix RTBs (1756-TBCH, 1756-TBNH, 1756-TBSH, and 1756-TBS6H). Any application that requires agency certification of the ControlLogix system using other wiring termination methods may require application specific approval by the certifying agency.

Types of ControlLogix Digital I/O Modules

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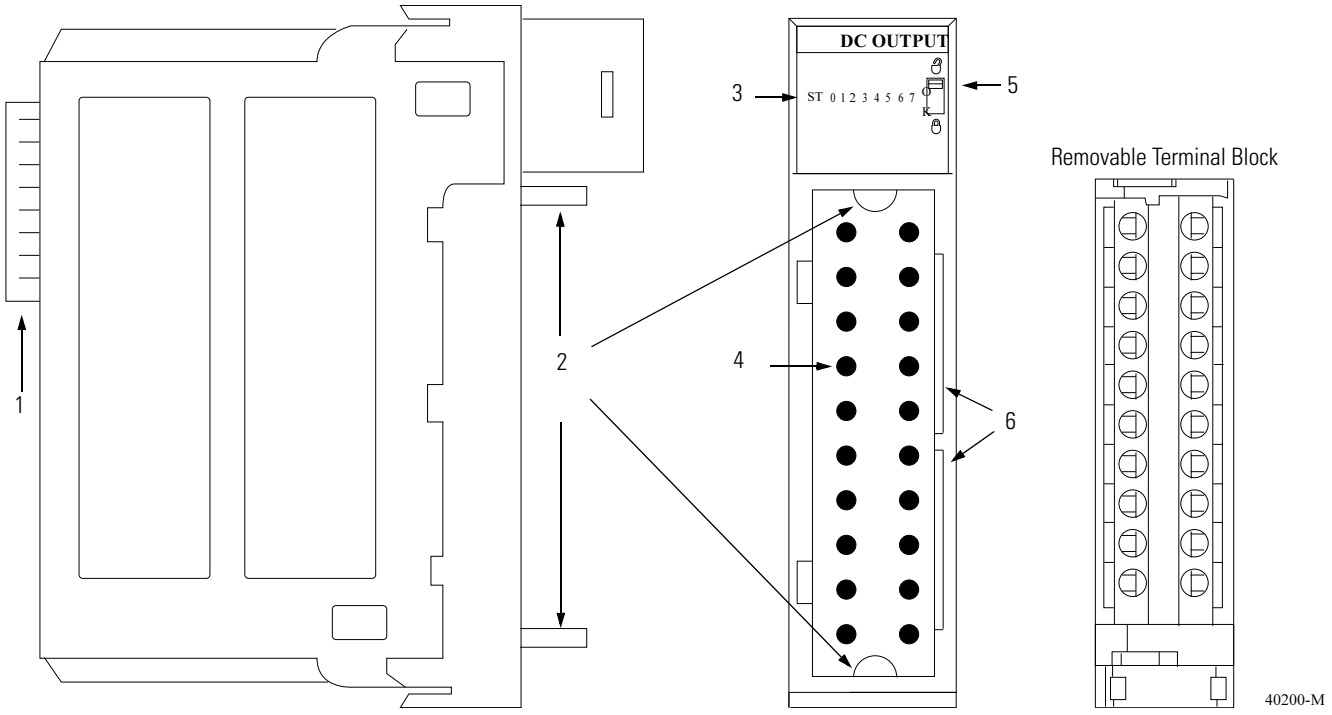
1756-OB8EI	10…30V DC 8-point e-fused isolated output module	197
1756-OB8I	10…30V DC 8-point isolated output module	200
1756-OB16D	19.2…30V DC 16-point diagnostic output module	203
1756-OB16E	10…31.2V DC 16-point e-fused output module	206
1756-OB16I	10…30V DC 16-point isolated output module	209
1756-OB16IS	10…30V DC scheduled, isolated output module	212
1756-OB32	10…31.2V DC 32-point output module	215
1756-OC8	30…60V DC 8-point output module	218
1756-OG16	Transitor-transitor logic (TTL) output module	221
1756-OH81	90…146V DC 8-point isolated output module	224
1756-ON8	10…30V AC 8-point output module	227
1756-OV16E	10…30V DC 16-point e-fused sinking current output module	230
1756-OV32E	10…30V DC 32-point electronically-fused sinking current output module	233
1756-OW16I	10…265V, 5-150V DC 16-point isolated contact module	236
1756-OX8I	10…265V, 5-150V DC 8-point isolated contact module	239

Parts Illustration of the ControlLogix Digital I/O Module



Item	Description
1	**Backplane Connector** - Interface for the ControlLogix system that connects the module to the backplane.
2	**Top and bottom guides** - Guides provide assistance in seating the RTB or IFM cable onto the module.
3	**Status indicators** - Indicators display the status of communication, module health, and input/output devices. Indicators help in troubleshooting anomalies.
4	**Connectors pins** - Input/output, power, and grounding connections are made to the module through these pins with the use of an RTB or IFM.
5	**Locking tab** - The locking tab anchors the RTB or IFM cable on the module, maintaining wiring connections.
6	**Slots for keying** - Mechanically keys the RTB to prevent inadvertently making the wrong wire connections to your module.

Module Identification and Status Information

Each ControlLogix I/O module maintains specific identification information that separates it from all other modules. This information assists you in tracking all the components of your system.

For example, you can track module identification information to be aware of exactly what modules are located in any ControlLogix rack at any time. While retrieving module identity, you can also retrieve the module's status.

Module Identification and Status Information

Item	Description
Product type	Module's product type, such as Digital I/O or Analog I/O module
Product code	Module's catalog number
Major revision	Module's major revision number
Minor revision	Module's minor revision number

Status	Module's status that shows the following information:
	• Controller ownership (if any)
	• Whether module has been configured
	• Device Specific Status, such as:
	  • Self-Test
	  • Flash update in progress
	  • Communications fault
	  • Not owned (outputs in Program mode)
	  • Internal fault (need flash update)
	  • Run mode
	  • Program mode (output mods only)
	• Minor recoverable fault
	• Minor unrecoverable fault
	• Major recoverable fault
	• Major unrecoverable fault

Vendor	Module manufacturer vendor, for example Allen-Bradley
Serial number	Module serial number
Length of ASCII text string	Number of characters in module's text string
ASCII text string	Module's ASCII text string description

IMPORTANT You must perform a WHO service to retrieve this information.

See page 275 for procedures on retrieving module identification information.

Notes:

Digital I/O Operation in the ControlLogix System

Introduction

I/O modules are the interface between the controller and the field devices that comprise the ControlLogix system. Digital I/O modules transfer data to devices that require just one bit to be represented (0 or 1). For example, a switch is open or closed, or a light is on or off.

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Ownership

Every I/O module in the ControlLogix system must be owned by a RSLogix 5000 controller. This owner-controller:

- stores configuration data for every module that it owns.
- can be local or remote in regard to the I/O module's position.
- sends the I/O module configuration data to define the module's behavior and begin operation with the control system.

Each ControlLogix I/O module must continuously maintain communication with its owner-controller to operate normally.

Typically, each module in the system will have only one owner. Input modules can have more than one owner. Output modules, however, are limited to a single owner.

For more information on the increased flexibility provided by multiple owners and the ramifications by using multiple owners, see Configuration Changes in an Input Module with Multiple Owners on page 36.

Use RSNetWorx and RSLogix 5000 Software

The I/O configuration portion of the RSLogix 5000 programming software generates the configuration data for each I/O module in the control system, whether the module is in a local or remote chassis. A remote chassis, also known as networked, contains the I/O module but not the module's owner-controller. A remote chassis can be connected to the controller via a scheduled connection on the ControlNet network or an EtherNet/IP network.

RSLogix 5000 configuration data is transferred to the controller during the program download and subsequently transferred to the appropriate I/O modules. I/O modules in the local chassis, and modules in a remote chassis connected via the EtherNet/IP network, or unscheduled connections on the ControlNet network, are ready to run as soon as the configuration data has been downloaded. However, to enable scheduled connections to I/O modules on the ControlNet network, you must schedule the network by using RSNetWorx for ControlNet software.

Running RSNetWorx software transfers configuration data to I/O modules on a scheduled ControlNet network and establishes a network update time (NUT) for the ControlNet network that is compliant with the desired communication options specified for each module during configuration.

Anytime a controller references a scheduled connection to I/O modules on a scheduled ControlNet network, you must run RSNetWorx software to configure the ControlNet network.

Refer to the following general steps when configuring I/O modules.

1. Configure all I/O modules for a given controller by using RSLogix 5000 programming software and download that information to the controller.

2. If the I/O configuration data references a scheduled connection to a module in a remote chassis connected via the ControlNet network, run RSNetWorx for ControlNet software to schedule the network.

3. After running RSNetWorx software, perform an online save of the RSLogix 5000 project so the configuration information that RSNetWorx software sends to the controller is saved.

IMPORTANT You must run RSNetWorx for ControlNet software whenever a new I/O module is added to a scheduled ControlNet chassis. When a module is permanently removed from a remote chassis, we recommend that you run RSNetWorx for ControlNet software to reschedule the network and optimize the allocation of network bandwidth.

Internal Module Operations

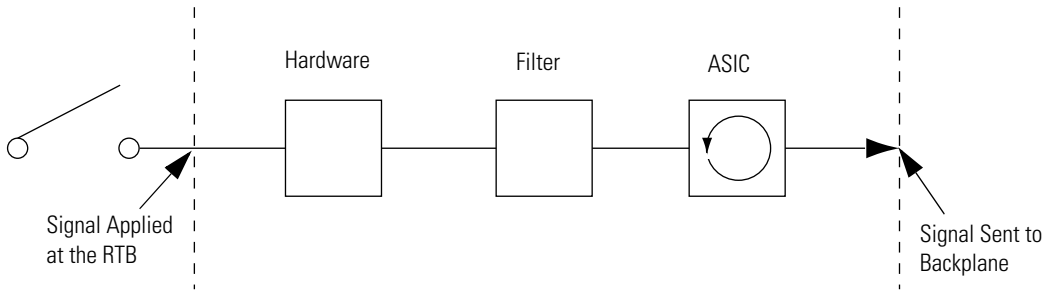
ControlLogix I/O modules experience signal propagation delays that must be accounted for during operation. Some of these delays are user-selectable, and some are inherent to the module hardware.

For example, there is a small delay (typically less than 1 ms) between when a signal is applied at the RTB of a ControlLogix input module and when a signal is sent to the system over the backplane; this typical time reflects a filter time of 0 ms for a DC input.

This section offers an explanation of the time limitations with ControlLogix I/O modules.

Input Modules

As shown in the illustration below, ControlLogix input modules receive a signal at the RTB and process it internally (that is, hardware delay, filter delay, ASIC delay) before sending a signal to the backplane via the requested packet interval (RPI) or at a Change of State (COS) occurrence. The RPI is a configured interval of time that determines when a module's data is sent to the controller.



The table defines some of the delay factors that affect the signal propagation on a module.

Delay	Description
Hardware	How the module is configured and the variance between the type of modules affects how the signal is processed.
Filter	User configuration varies between modules, thus affecting the signal propagation.
ASIC	ASIC scan = 200 µs.

EXAMPLE

A typical delay time can be estimated despite the number of factors that may contribute. For example, if you are turning on a 1756-IB16 module at 24V DC in 25 °C (77 °F) conditions, the signal propagation delay is affected by:

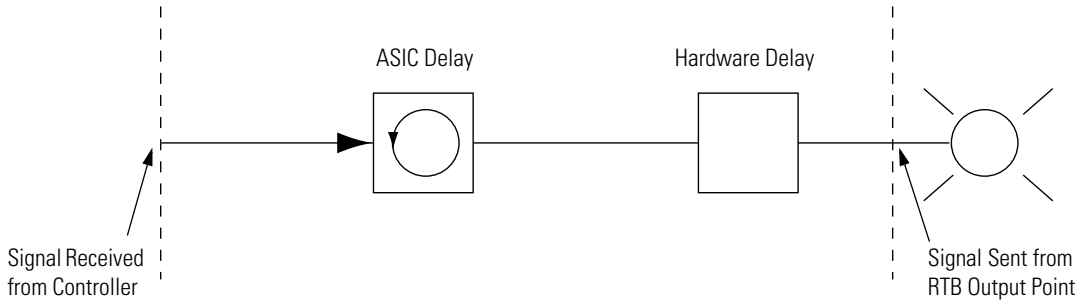
- hardware delay to energize the input (typically 290 µs on this module).
- user-configurable filter time (0, 1, or 2 ms).
- ASIC scan (200 µs).

In the worst case scenario (with a filter time of 0 ms), the 1756-IB16 module has a 490 µs signal propagation delay.

These times are not guaranteed. We list nominal and maximum delay times for each module in Chapter 7.

Output Modules

ControlLogix output modules receive a signal from the controller and process it internally (that is, ASIC delay and hardware delay) before sending a signal to the output device via the RTB.



The table defines some of the delay factors that affect the signal propagation on a module.

Delay	Description
ASIC	ASIC scan = 200 µs typical
Hardware	How the module is configured and the variance between the type of modules affects how the signal is processed.

EXAMPLE

A typical delay time can be estimated despite the number of factors that may contribute. For example, if you are turning on a 1756-OB16E module at 24V DC in 25 °C (77 °F) conditions, the signal propagation delay is affected by:

- hardware delay to energize the output (typically 70 µs on this module).
- ASIC scan (200 µs).

In the worst case scenario, the 1756-OB16E module has a 270 µs signal propagation delay.

These times are not guaranteed. We list nominal and maximum delay times for each module in Chapter 7.

Connections

With respect to ControlLogix I/O modules, a connection is the data transfer link between a controller and an I/O module. These are the connections:

- Direct connections
- Rack connections

The table lists the advantages/disadvantages of each connection type.

Connection Type	Advantages	Disadvantages
Direct connections	All input and data echo information is transferred, including diagnostic information and fusing data.	With more data transferring over the network, your system does not operate as efficiently as with rack connections.
Rack connections	Connection usage is economized. The owner-controller has a single RPI value for each connection.	Input and data echo information is limited to general faults and data.

Direct Connections

A direct connection is a real-time data transfer link between the controller and the device that occupies the slot that the configuration data references. When module configuration data is downloaded to an owner-controller, the controller attempts to establish a direct connection to each of the modules referenced by the data.

If a controller has configuration data referencing a slot in the control system, the controller periodically checks for the presence of a device there. When a device's presence is detected there, the controller automatically sends the configuration data.

If the data is appropriate to the module found in the slot, a connection is made and operation begins. If the configuration data is not appropriate, the data is rejected and an error message appears in the software. In this case, the configuration data can be inappropriate for any of a number of reasons. For example, a module's configuration data may be appropriate except for a mismatch in electronic keying that prevents normal operation.

The controller maintains and monitors its connection with a module. Any break in the connection, such as module faults or removal of the module from the chassis while under power, causes the controller to set fault status bits in the data area associated with the module. The RSLogix 5000 programming software monitors this data area to annunciate the modules' failures.

Rack Connections

When a digital I/O module is located in a remote chassis (with respect to its owner), you may choose **r**ack optimization or listen-only rack optimization in the Comm Format pull-down menu during the initial module configuration. This depends on the bridge module configuration. If the bridge module is selected for the Listen-only rack option, then the I/O module allows only the Listen-only rack option.

A rack connection economizes connection usage between the owner-controller and digital I/O in the remote chassis. Rather than having several direct connections with individual RPI values, the owner-controller has a single rack connection with a single RPI value. That RPI value accommodates all digital I/O modules in the rack connection.

IMPORTANT

Because rack connections are applicable only in applications that use a remote chassis, you must configure the Communication Format for both the remote I/O module and the remote 1756-CNB module or Ethernet module.

Make sure you configure both modules for Rack Optimization. If you choose a different Communication Format for each, the controller makes two connections to the same chassis (one for each format) and the same data travels across the ControlNet network.

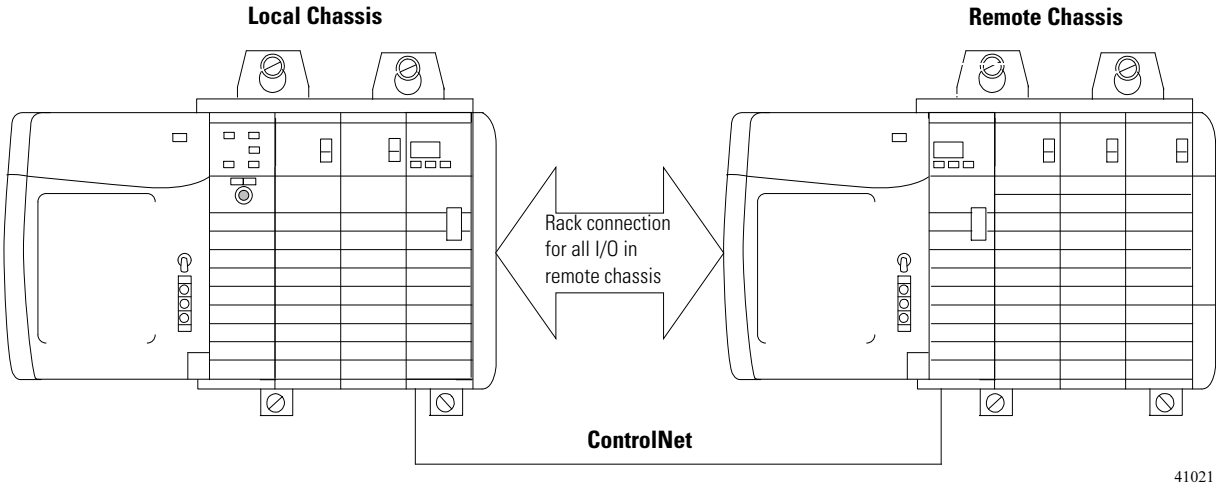
If you use Rack Optimization for both modules, you preserve bandwidth and configure your system to operate more efficiently.

The input (or data echo) information is limited to general faults and data. No additional status (for example, diagnostic) is available.

IMPORTANT

Each controller can establish connections, in any combination of direct or rack. In other words, you can use a rack connection between an owner-controller and multiple remote I/O modules while simultaneously using a direct connection between that same controller and any other I/O modules in the same remote chassis.

The illustration below shows how this rack connection option eliminates the need for three separate connections. The owner-controller in the local chassis communicates with all the I/O modules in the remote chassis but uses only one connection. The ControlNet bridge module sends data from the modules simultaneously at the RPI.



Suggestions for Rack Connection Usage

We recommend that you use a rack connection for applications in which:

- standard digital I/O modules are used.
- non-fused digital output modules are used.
- your owner-controller is running low on connections.

IMPORTANT Rack connections are available only to digital I/O modules. However, do not use a rack connection for diagnostic I/O modules or fused output modules. Diagnostic and fused output data will not be transferred over a rack connection. This defeats the purpose of using those modules.

Input Module Operation

In traditional I/O systems, controllers poll input modules to obtain their input status. In the ControlLogix system, a controller does not poll digital input modules. Instead, the modules multicast their data either upon Change of State or periodically. The frequency depends on the options chosen during configuration and where in the control system that input module physically resides.

IMPORTANT This is called the Producer/Consumer model. The input module is the producer of input data and the controller is the consumer of the data.

All ControlLogix inputs are updated asynchronous to the controller's task execution. In other words, an input may be updated in the controller at any time during the controller's execution of the tasks it is configured to run. The input device determines when the input is sent, based on its configuration.

An input module's behavior also varies depending upon whether it operates in the local chassis or in a remote chassis. The following sections detail the differences in data transfers between these set-ups.

Input Modules in a Local Chassis

When a module resides in the same chassis as the owner-controller, the following two configuration parameters will affect how and when an input module multicasts data:

- Requested Packet Interval (RPI)
- Change of State (COS)

Requested Packet Interval (RPI)

This interval defines the slowest rate at which a module multicasts its data to the owner-controller. The time ranges from 200 µs…750 ms and is sent to the module with all other configuration parameters. When the specified time frame elapses, the module will multicast data. This is also called a cyclic update.

Change of State (COS)

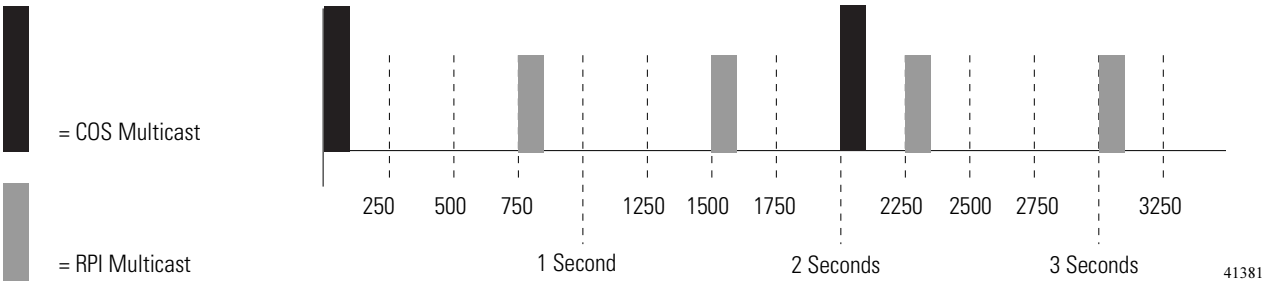
This parameter instructs the module to transfer data whenever a specified input point transitions from On to Off or Off to On. The transition is referred to as a Change of State.

IMPORTANT The module's Change of State (COS) feature defaults to Enabled for both On to Off and Off to On.

COS selection occurs on a per-point basis, but all module data is multicast when any point enabled for COS changes state. COS is more efficient than RPI because it multicasts data only when a change occurs.

IMPORTANT You must specify an RPI regardless of whether you enable COS. If a change does not occur within the RPI timeframe, the module still will multicast data at the rate specified by the RPI.

For example, if an input is changing state consistently every two seconds and the RPI is set at 750 ms, the data transfer will look like the illustration.



Because the RPI and COS functions are asynchronous to the program scan, it is possible for an input to change state during program scan execution. The point must be 'buffered' to prevent this from occurring. Copy the input data from your input tags to another structure and use the data from there.

TIP To minimize traffic and conserve bandwidth, we recommend you use a larger RPI value if the COS option is used and the module is in the same chassis as its owner.

Trigger Event Tasks

When configured, ControlLogix digital input modules can trigger an event task. The event task lets you execute a section of logic immediately when an event (that is, receipt of new data) occurs.

Your ControlLogix digital I/O module can trigger event tasks whenever module input data state changes (for example when a COS occurs). Refer to these considerations when using a digital input module to trigger an event task.

- Only one input module can trigger a specific event task.
- Input modules trigger the event task based on the module's COS configuration. The COS configuration defines which points prompt the module to produce data if they turn On or Off. This production of data (due to COS) triggers the event task.
- Typically, enable COS for only one point on the module. If you enable COS for multiple points, a task overlap of the event task may occur.

For more information on using event tasks, see the Logix5000 Controllers Tasks, Programs, and Routines Programming Manual, publication 1756-PM005.

Input Modules in a Remote Chassis

If an input module physically resides in a chassis other than where the owner-controller is (that is, a remote chassis connected via the ControlNet network), the role of the RPI and the module's COS behavior changes slightly with respect to getting data to the owner.

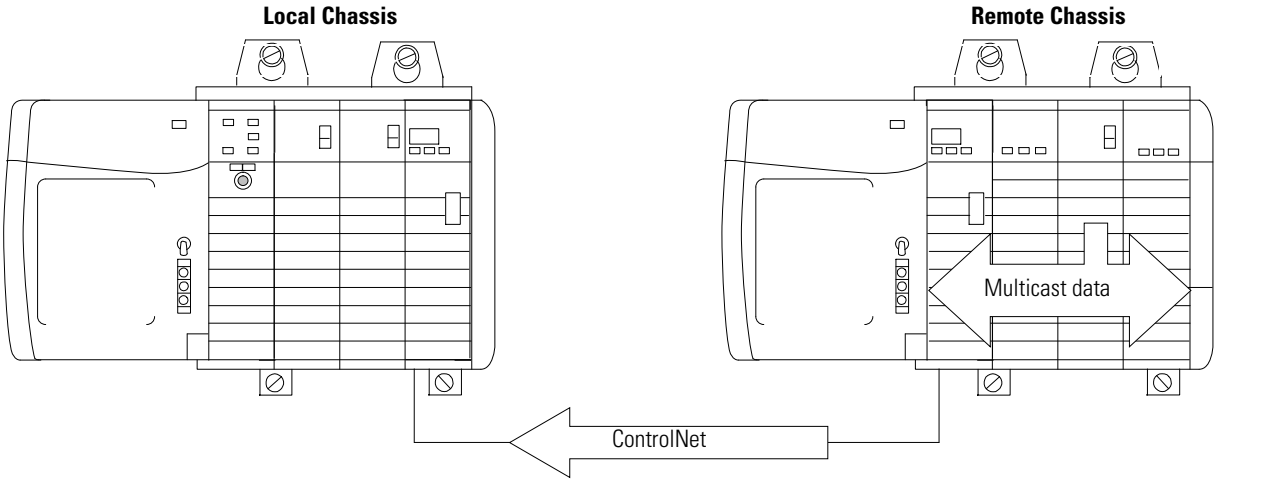
The RPI and COS behavior still define when the module will multicast data within its own chassis (as described in the previous section). But, only the value of the RPI determines when the owner-controller will receive it over the network.

Remote Input Modules Connected Via the ControlNet Network

When an RPI value is specified for an input module in a remote chassis connected by a scheduled ControlNet network, in addition to instructing the module to multicast data within its own chassis, the RPI also 'reserves' a spot in the stream of data flowing across the ControlNet network.

The timing of this 'reserved' spot may or may not coincide with the exact value of the RPI. But, the control system will guarantee that the owner-controller will receive data at least as often as the specified RPI.

As shown in the illustration below, the input data within the remote chassis is multicast at the configured RPI. The ControlNet bridge module sends input data back to the owner-controller at least as often as the RPI.



The module's RPI and 'reserved' spot on the network are asynchronous to each other. This means there are best and worst case scenarios as to when the owner-controller will receive updated channel data from the module in a networked chassis.

Best Case RPI Multicast Scenario

In the best case scenario, the module performs an RPI multicast with updated channel data just before the 'reserved' network slot is made available. In this case, the remotely-located owner receives the data almost immediately.

Worst Case RPI Multicast Scenario

In the worst case scenario, the module performs an RPI multicast just after the 'reserved' network slot has passed. In this case, the owner-controller will not receive data until the next available network slot.

IMPORTANT Enabling the COS feature on an input module in a remote chassis allows the module to multicast data at both the RPI rate and when the input changes state. This helps to reduce the worst case time.

When selecting values for the remotely located module's RPI, system throughput is optimized when its RPI value is a power of two times the current NUT running on the ControlNet network.

For example, the following table shows recommended RPI values for a system by using a NUT of 5 ms.

Recommended RPI Values for System by Using NUT of 5 ms

NUT=5 ms	$x2^0$	$x2^1$	$x2^2$	$x2^3$	$x2^4$	$x2^5$	$x2^6$	$x2^7$
Optimal RPI Values (ms)	5 ms	10 ms	20 ms	40 ms	80 ms	160 ms	320 ms	640 ms

Remote Input Modules Connected Via the EtherNet/IP Network

When remote digital input modules are connected to the owner-controller via an EtherNet/IP network, data is transferred to the owner-controller in the following way:

- at the RPI, the module produces data within its own chassis.
- at the COS (if enabled), the 1756 Ethernet bridge module in the remote chassis immediately sends the module's data over the network to the owner-controller as long as it has not sent data within a timeframe that is one-quarter the value of the digital input module's RPI. This prevents flooding the network with data.

  For example, if a digital input module uses an RPI = 100 ms, the Ethernet module sends module data immediately on receiving it if another data packet was not sent within the last 25 ms.

TIP For more information, see the Guidelines to Specify an RPI Rate for I/O Modules section in the Logix5000 Controllers Design Considerations Reference Manual, publication 1756-RM094.

Output Module Operation

An owner-controller sends output data to an output module when either one of two things occur:

- at the end of every one of its tasks (local chassis only).
- at the rate specified in the module's RPI.

When an output module physically resides in a remote chassis, with respect to the owner-controller, the owner-controller sends data to the output module **only** at the RPI rate specified for the module. Updates are not performed at the end of the owner-controller's tasks.

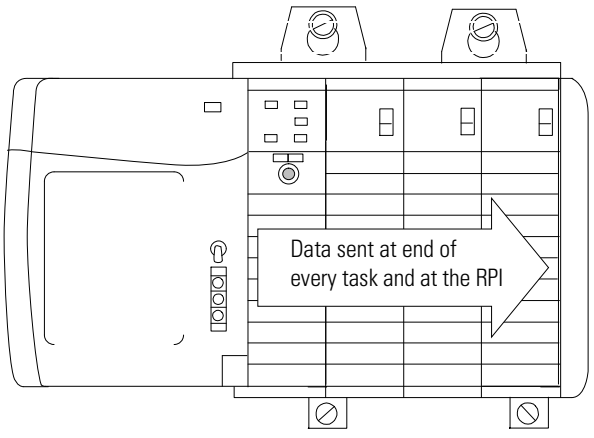
Whenever the module receives data from the controller, it immediately multicasts the output commands it received to the rest of the system. The actual output data is echoed by the output module as input data and multicast back out onto the network. This is called Output Data Echo.

IMPORTANT In this Producer/Consumer model, the output module is the consumer of the controller's output data and the producer of the data echo.

Output Modules in a Local Chassis

The owner-controller updates ControlLogix digital output modules in the local chassis at the end of every task and at the RPI.

When you specify an RPI value for a digital output module, you instruct the owner-controller when to broadcast the output data to the module. If the module resides in the same chassis as the owner-controller (see illustration below), the module receives the data almost immediately after the owner-controller sends it (backplane transfer times are small).



Depending on the value of the RPI, with respect to the length of the program scan, the output module can receive and 'echo' data multiple times during one program scan.

Output Modules in a Remote Chassis

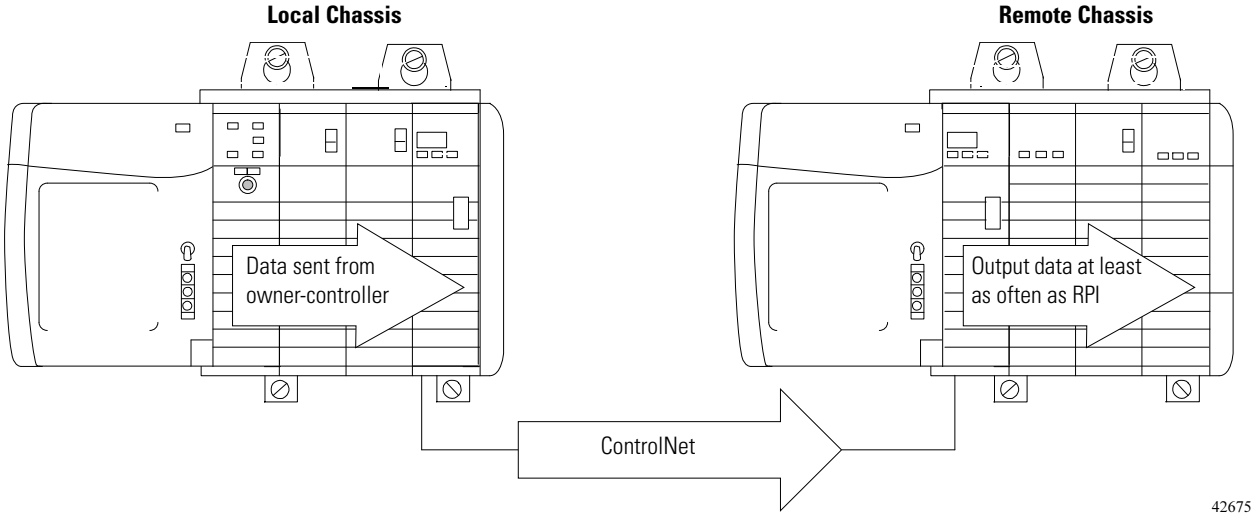
If an output module physically resides in a chassis other than that of the owner-controller (that is, a remote chassis connected via the ControlNet network), the owner-controller sends data to the output module only at the RPI rate specified. Updates are not performed at the end of the controller's tasks.

In addition, the role of the RPI for a remote output module changes slightly, with respect to getting data from the owner-controller.

Remote Output Modules Connected Via the ControlNet Network

When an RPI value is specified for an output module in a remote chassis connected to the owner-controller by a scheduled ControlNet network, in addition to instructing the owner-controller to multicast the output data within its own chassis, the RPI also 'reserves' a spot in the stream of data flowing across the ControlNet network.

The timing of this 'reserved' spot may or may not coincide with the exact value of the RPI. But, the control system will guarantee that the output module will receive data **at least as often** as the specified RPI, as shown in the illustration below.



The 'reserved' spot on the network and the output data sent by the controller are asynchronous to each other. This means there are Best and Worst Case scenarios as to when the owner-controller will receive updated channel data from the module in a networked chassis.

Best Case RPI Multicast Scenario

In the best case scenario, the owner-controller sends the output data just before the 'reserved' network slot is made available. In this case, the remotely located output module receives the data almost immediately.

Worst Case RPI Multicast Scenario

In the worst case scenario, the owner-controller sends the output data just after the 'reserved' network slot has passed. In this case, the output module does not receive data until the next available network slot.

IMPORTANT

These best and worst case scenarios indicate the time required for output data to transfer from the owner-controller to the module once the owner-controller has produced it. They do not take into account the user program time in the owner-controller.

The receipt of new data is a function of the length of the user program and its asynchronous relationship with the RPI.

The owner-controller updates remotely-located digital output modules at the end of each task as well as at the RPI, as described earlier in this section, if your application uses:

- 1756-CNB/D or 1756-CNBR/D modules.
- RSLogix 5000 software, version 8 or later.

Remote Output Modules Connected Via the EtherNet/IP Network

When remote digital output modules are connected to the owner-controller via an EtherNet/IP network, the controller sends output data:

- at the end of each program scan within the local chassis.
- when either the RPI timer expires or an Immediate Output (IOT) instruction, if programmed, is executed. An IOT sends data immediately and resets the RPI timer.

Listen-only Mode

Any controller in the system can listen to the data from any I/O module (for example, input data, 'echoed' output data, or 'echoed' diagnostic information). This even applies if the controller does not own the module (that is, it does not have to hold the module's configuration data to listen to the module).

During the I/O configuration process, you can specify one of several 'Listen' modes in the Comm Format pull-down menu. For more information, see Communication Format in Chapter 6.

Choosing a 'Listen' mode option allows the controller and module to establish communication without the controller sending any configuration data. In this instance, another controller owns the module being listened to.

IMPORTANT In the Listen-only mode, controllers will continue to receive data multicast from the I/O module as long as the connection between the owner-controller and I/O module is maintained.

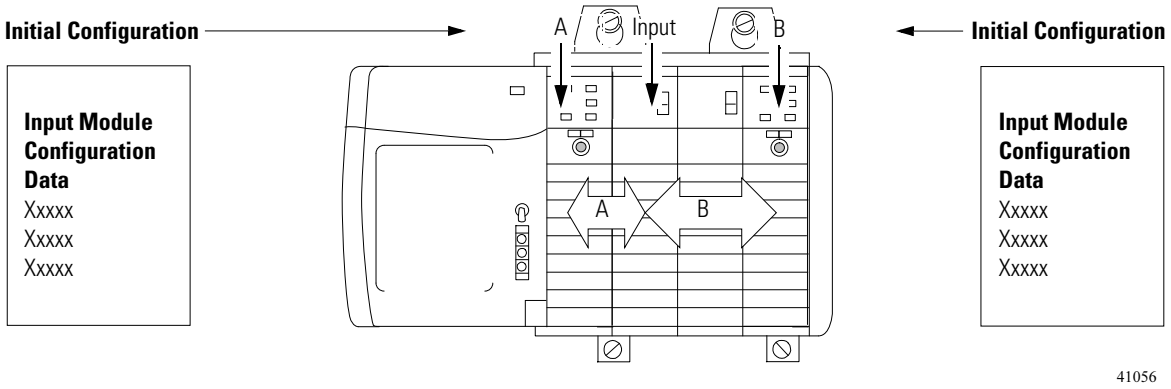
If the connection between the owner-controller and module is broken, the module stops multicasting data and connections to all 'Listening controllers' are also broken.

Multiple Owners of Input Modules

Because 'Listening controllers' lose their connections to modules when communication with the owner-controller stop, the ControlLogix system lets you define more than one owner-controller for input modules.

IMPORTANT Only input modules can have multiple owners. If multiple owners are connected to the same input module, they must maintain identical configuration for that module.

In the illustration, Controller A and Controller B both have been configured to be the owner-controller of the same input module.



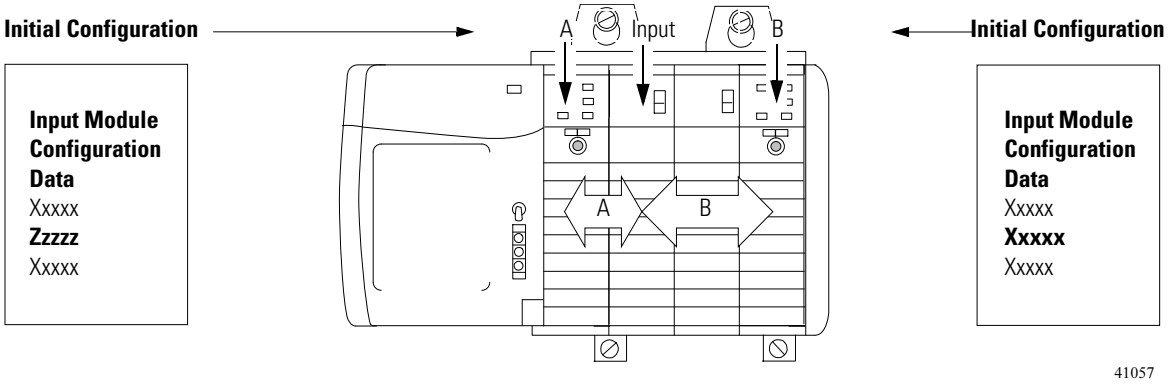
As soon as a controller receives its user program, it will try to establish a connection with the input module. Whichever controller's configuration data arrives first (shown as A and B in the illustration) establishes a connection. When the second controller's data arrives, the module compares it to its current configuration data (the data received and accepted from the first controller).

If the configuration data sent by the second controller matches the data sent by the first controller, that connection is also accepted. If any parameter of the second configuration data is different from the first, the module rejects the connection and the user is informed by an error in the software or programatically via a ladder logic program.

The advantage of multiple owners over a 'Listen-mode' connection is that now either of the controllers can break the connection to the module and the module will continue to operate and multicast data to the system because of the connection maintained by the other controller.

Configuration Changes in an Input Module with Multiple Owners

You must be careful when changing an input module's configuration data in a multiple owner scenario. When the configuration data is changed in one of the owners, for example, Controller A, and sent to the module, that configuration data is accepted as the new configuration for the module. Controller B will continue to listen, unaware that any changes have been made in the module's behavior, as illustrated below.



IMPORTANT A pop-up screen in RSLogix 5000 software alerts you to the possibility of a multiple owner-controller situation and lets you inhibit the connection before changing the module's configuration. When changing configuration for a module with multiple owners, we recommend the connection be inhibited.

To prevent other owners from receiving potentially erroneous data, do the following steps when changing a module's configuration in a multiple owner-controller scenario while online.

1. For each owner-controller, inhibit the controller's connection to the module, either in the software on the Connection tab or the pop-up window warning of the multiple owner-controller condition.

2. Make the appropriate configuration data changes in the software. For detailed information on using RSLogix 5000 software to change configuration, see Chapter 6.

3. Repeat step 1 and step 2 for all owner-controllers, making the exact same changes in all controllers.

4. Disable the Inhibit box in each owner's configuration.

Notes:

ControlLogix Standard Digital I/O Module Features

Introduction

This chapter describes devices compatible with ControlLogix I/O modules and features that are specific to various modules. Some of these features include data transfer on either Change of State or Cyclic Time, output data echo, fusing, field power loss detection, and diagnostic latch of information. The latter two options are available only on the 1756-OA8E module.

Topic	Page
Input Module Compatibility	40
Output Module Compatibility	41
Features on ControlLogix Standard Digital I/O Modules	42
Features Specific to Standard Input Modules	56
Features Specific to Standard Output Modules	60
Fault and Status Reporting Between Input Modules and Controllers	66
Fault and Status Reporting Between Output Modules and Controllers	67

Before proceeding, we suggest you take a few minutes to review a list of standard digital I/O modules.

Cat. No.	Description
1756-IA16	74…132V AC 16-point input module
1756-IA16I	79…132V AC 16-point isolated input module
1756-IA32	74…132V AC 32-point input module
1756-IB16	10…31.2V DC 16-point input module
1756-IB16I	10…30V DC 16-point isolated input module
1756-IB32	10…31.2V DC 32-point input module
1756-IC16	30…60V DC 16-point input module
1756-IG16	Transitor-transitor logic (TTL) input module
1756-IH16I	90…146V DC 16-point isolated input module
1756-IM16I	159…265V AC 16-point isolated input module
1756-IN16	10…30V AC 16-point input module
1756-IV16	10…30V DC 16-point sourcing current input module
1756-IV32	10…30V DC 32-point sourcing current input module
1756-OA8	74…265V AC 8-point output module
1756-OA8E	74…132V AC 8-point e-fused output module

Cat. No.	Description
1756-OA16	74…265V AC 16-point output module
1756-OA16I	74…265V AC 16-point isolated output module
1756-OB8	10…30V DC 8-point output module
1756-OB8EI	10…30V DC 8-point e-fused isolated output module
1756-OB8I	10…30V DC 8-point isolated output module
1756-OB16E	10…31.2V DC 16-point e-fused output module
1756-OB16I	10…30V DC 16-point isolated output module
1756-OB16IS	10…30V DC scheduled isolated output module
1756-OB32	10…31.2V DC 32-point output module
1756-OC8	30…60V DC 8-point output module
1756-OG16	Transitor-transitor logic (TTL) output module
1756-OH8I	90…146V DC 8-point isolated output module
1756-ON8	10…30V AC 8-point output module
1756-OV16E	10…301V DC 16-point e-fused sinking current output module
1756-OV32E	10…30V DC 32-point electronically-fused sinking current output module
1756-OW16I	10…265V. 5-150V DC 16-point isolated contact module
1756-OX8I	10…265V, 5-150V DC 8-point isolated contact module

Input Module Compatibility

ControlLogix digital input modules interface to sensing devices and detect whether they are On or Off.

ControlLogix input modules convert AC or DC On/Off signals from user devices to appropriate logic level for use within the processor. Typical input devices include:

- proximity switches.
- limit switches.
- selector switches.
- float switches.
- push button switches.

When designing a system that uses ControlLogix input modules, you must consider:

- the voltage necessary for your application.
- whether you need a solid state device.
- current leakage.
- if your application should use sinking or sourcing wiring.

For more information on compatibility of other Allen-Bradley Company products to ControlLogix input modules, see the I/O Systems Overview, publication CIG-2.1.

Output Module Compatibility

ControlLogix output modules may be used to drive a variety of output devices. Typical output devices compatible with the ControlLogix outputs include:

- motor starters.
- solenoids.
- indicators.

Follow these guidelines when designing a system.

- Make sure that the ControlLogix outputs can supply the necessary surge and continuous current for proper operation.
- Make sure that the surge and continuous current are not exceeded. Damage to the module could result.

When sizing output loads, check the documentation supplied with the output device for the surge and continuous current needed to operate the device.

The ControlLogix standard digital outputs are capable of directly driving the ControlLogix standard digital inputs. The exceptions are the AC and DC diagnostic input modules. When diagnostics are used a shunt resistor is required for leakage current.

For more information specifically on the compatibility of motor starters to ControlLogix output modules, see Appendix E.

For more information on compatibility of other Rockwell Automation products to ControlLogix output modules, see the I/O Systems Overview, publication CIG-SO001.

Features on ControlLogix Standard Digital I/O Modules

The table below lists features on ControlLogix standard digital I/O modules.

IMPORTANT Some of the features described are not available on all ControlLogix standard digital I/O modules. The table lists which modules support each feature.

Topic	Page	Available Modules
Removal and Insertion Under Power (RIUP)	43	All standard digital input and output modules
Module Fault Reporting	43	
Software Configurable	43	
Electronic Keying	44	
Module Inhibiting	51	
Use the System Clock to Timestamp Inputs and Schedule Outputs	52	
Producer/Consumer Model	54	
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UL, CSA, FM, CE, C-Tick, Ex, TÜV Agency Approvals	55	
Data Transfer on Either Cyclic Time or Change of State	56	Standard digital input modules
Software Configurable Filter Times	59	
Isolated and Non-Isolated Varieties of Input Modules	59	
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Configurable Point-Level Output Fault States	60	Standard digital output modules
Output Data Echo	61	
Isolated and Non-Isolated Varieties of Output Modules	62	
Multiple Output Point Densities	62	
Electronic Fusing	62	1756-OA8E 1756-OB16E 1756-OB8EI 1756-OV16E 1756-OV32E
Field Power Loss Detection	65	1756-OA8E
Diagnostic Latch of Information	65	1756-OA8E
Time-scheduled Output Control	53	1756-OB16IS

Removal and Insertion Under Power (RIUP)

All ControlLogix I/O modules may be inserted and removed from the chassis while power is applied. This feature allows greater availability of the overall control system because, while the module is being removed or inserted, there is no additional disruption to the rest of the controlled process. This helps prevent an entire production line from having to be shut down.

Module Fault Reporting

ControlLogix digital I/O modules provide both hardware and software indication when a module fault has occurred. Each module's fault status indicator and the RSLogix 5000 programming software will graphically display this fault and include a fault message describing the nature of the fault.

This feature lets you determine how your module has been affected and what action should be taken to resume normal operation.

Software Configurable

RSLogix 5000 programming software uses a custom, easily understood interface to write configuration. All module features are enabled or disabled through the I/O configuration portion of the software.

You can also use the software to interrogate any module in the system to retrieve:

- serial number.
- firmware revision information.
- product code.
- vendor.
- error/fault information.
- diagnostic counters.

By eliminating such tasks as setting hardware switches and jumpers, the software makes module configuration easier and more reliable.

Electronic Keying

The electronic keying feature automatically compares the expected module, as shown in the RSLogix 5000 I/O Configuration tree, to the physical module before I/O communication begins. You can use electronic keying to help prevent communication to a module that does not match the type and revision expected.

For each module in the I/O Configuration tree, the user-selected keying option determines if, and how, an electronic keying check is performed. Typically, three keying options are available.

- Exact Match
- Compatible Keying
- Disable Keying

You must carefully consider the benefits and implications of each keying option when selecting between them. For some specific module types, fewer options are available.

Electronic keying is based on a set of attributes unique to each product revision. When a Logix5000 controller begins communicating with a module, this set of keying attributes is considered.

Keying Attributes

Attribute	Description
Vendor	The manufacturer of the module, for example, Rockwell Automation/Allen-Bradley.
Product Type	The general type of the module, for example, communication adapter, AC drive, or digital I/O.
Product Code	The specific type of module, generally represented by its catalog number, for example, 1756-IB16I.
Major Revision	A number that represents the functional capabilities and data exchange formats of the module. Typically, although not always, a later, that is higher, Major Revision supports at least all of the data formats supported by an earlier, that is lower, Major Revision of the same catalog number and, possibly, additional ones.
Minor Revision	A number that indicates the module's specific firmware revision. Minor Revisions typically do not impact data compatibility but may indicate performance or behavior improvement.

You can find revision information on the General tab of a module's Properties dialog box.

General Tab

IMPORTANT Changing electronic keying selections online may cause the I/O communication connection to the module to be disrupted and may result in a loss of data.

Exact Match

Exact Match keying requires all keying attributes, that is, Vendor, Product Type, Product Code (catalog number), Major Revision, and Minor Revision, of the physical module and the module created in the software to match precisely to establish communication. If any attribute does not match precisely, I/O communication is not permitted with the module or with modules connected through it, as in the case of a communication module.

Use Exact Match keying when you need the system to verify that the module revisions in use are exactly as specified in the project, such as for use in highly-regulated industries. Exact Match keying is also necessary to enable Automatic Firmware Update for the module via the Firmware Supervisor feature from a Logix5000 controller.

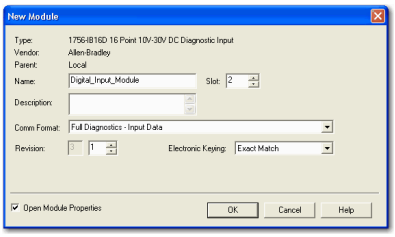
EXAMPLE

In the following scenario, **Exact Match keying prevents I/O communication**:

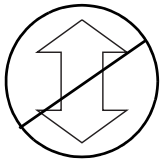
- The module configuration is for a 1756-IB16D module with module revision 3.1. The physical module is a 1756-IB16D module with module revision 3.2. In this case, communication is prevented because the Minor Revision of the module does not match precisely.

Module Configuration

Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IB16D
Major Revision = 3
Minor Revision = 1

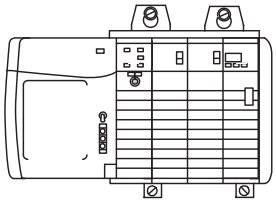


Communication is prevented



Physical Module

Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IB16D
Major Revision = 3
Minor Revision = 2



IMPORTANT

Changing electronic keying selections online may cause the I/O Communication connection to the module to be disrupted and may result in a loss of data.

Compatible Keying

Compatible Keying indicates that the module determines whether to accept or reject communication. Different module families, communication adapters, and module types implement the compatibility check differently based on the family capabilities and on prior knowledge of compatible products.

Compatible Keying is the default setting. Compatible Keying allows the physical module to accept the key of the module configured in the software, provided that the configured module is one the physical module is capable of emulating. The exact level of emulation required is product and revision specific.

With Compatible Keying, you can replace a module of a certain Major Revision with one of the same catalog number and the same or later, that is higher, Major Revision. In some cases, the selection makes it possible to use a replacement that is a different catalog number than the original. For example, you can replace a 1756-CNBR module with a 1756-CN2R module.

Release notes for individual modules indicate the specific compatibility details.

When a module is created, the module developers consider the module's development history to implement capabilities that emulate those of the previous module. However, the developers cannot know future developments. Because of this, when a system is configured, we recommend that you configure your module by using the earliest, that is, lowest, revision of the physical module that you believe will be used in the system. By doing this, you can avoid the case of a physical module rejecting the keying request because it is an earlier revision than the one configured in the software.

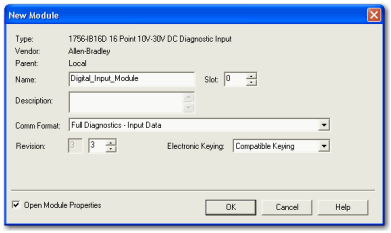
EXAMPLE

In the following scenario, **Compatible Keying prevents I/O communication**:

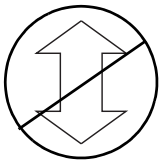
- The module configuration is for a 1756-IB16D module with module revision 3.3. The physical module is a 1756-IB16D module with module revision 3.2. In this case, communication is prevented because the minor revision of the module is lower than expected and may not be compatible with 3.3.

Module Configuration

Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IB16D
Major Revision = 3
Minor Revision = 3

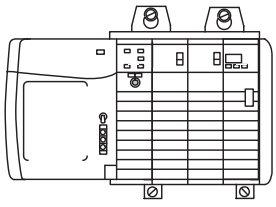


Communication is prevented



Physical Module

Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IB16D
Major Revision = 3
Minor Revision = 2



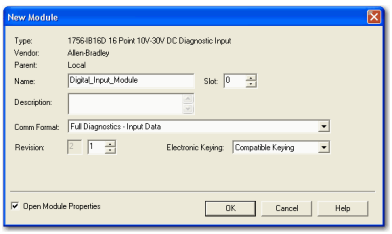
EXAMPLE

In the following scenario, **Compatible Keying allows I/O communication**:

- The module configuration is for a 1756-IB16D module with module revision 2.1. The physical module is a 1756-IB16D module with module revision 3.2. In this case, communication is allowed because the major revision of the physical module is higher than expected and the module determines that it is compatible with the prior major revision.

Module Configuration

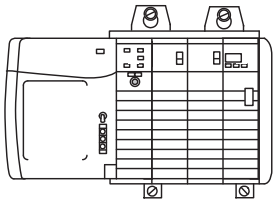
Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IB16D
Major Revision = 2
Minor Revision = 1



Communication is allowed

Physical Module

Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IB16D
Major Revision = 3
Minor Revision = 2



IMPORTANT

Changing electronic keying selections online may cause the I/O communication connection to the module to be disrupted and may result in a loss of data.

Disabled Keying

Disabled Keying indicates the keying attributes are not considered when attempting to communicate with a module. Other attributes, such as data size and format, are considered and must be acceptable before I/O communication is established. With Disabled Keying, I/O communication may occur with a module other than the type specified in the I/O Configuration tree with unpredictable results. We generally do not recommend using Disabled Keying.

ATTENTION

Be extremely cautious when using Disabled Keying; if used incorrectly, this option can lead to personal injury or death, property damage, or economic loss.

If you use Disabled Keying, you must take full responsibility for understanding whether the module being used can fulfill the functional requirements of the application.

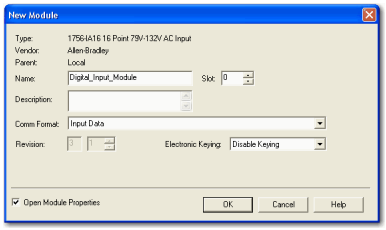
EXAMPLE

In the following scenario, **Disable Keying prevents I/O communication**:

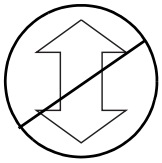
- The module configuration is for a 1756-IA16 digital input module. The physical module is a 1756-IF16 analog input module. In this case, **communication is prevented because the analog module rejects the data formats that the digital module configuration requests**.

Module Configuration

Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IA16
Major Revision = 3
Minor Revision = 1

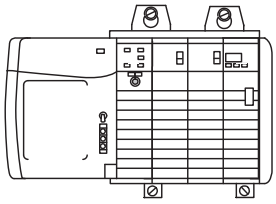


Communication is prevented



Physical Module

Vendor = Allen-Bradley
Product Type = Analog Input Module
Catalog Number = 1756-IF16
Major Revision = 3
Minor Revision = 2



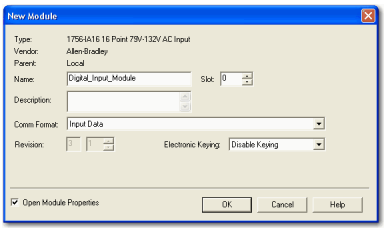
EXAMPLE

In the following scenario, **Disable Keying allows I/O communication**:

- The module configuration is for a 1756-IA16 digital input module. The physical module is a 1756-IB16 digital input module. In this case, communication is allowed because the two digital modules share common data formats.

Module Configuration

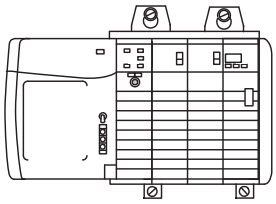
Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IA16
Major Revision = 2
Minor Revision = 1



Communication is allowed

Physical Module

Vendor = Allen-Bradley
Product Type = Digital Input Module
Catalog Number = 1756-IB16
Major Revision = 3
Minor Revision = 2



IMPORTANT

Changing electronic keying selections online may cause the I/O communication connection to the module to be disrupted and may result in a loss of data.

Module Inhibiting

Module inhibiting lets you indefinitely suspend a connection between an owner-controller and a digital I/O module without having to remove the module from the configuration. This process lets you temporarily disable communication to a module, such as to perform maintenance. You can do this by the following ways.

- You write configuration for an I/O module but inhibit the module to prevent it from communicating with the owner-controller. In this case, the owner does not establish a connection and configuration is not sent to the module until the connection is uninhibited.
- In your application, a controller already owns a module, has downloaded configuration to the module and is currently exchanging data over the connection between the devices. In this case, you can inhibit the module and the owner-controller behaves as if the connection to the module does not exist.

IMPORTANT Whenever you inhibit an output module, it enters the Program mode and all outputs change to the state configured for the Program mode. For example, if an output module is configured so that the state of the outputs go to zero (0) during Program mode, whenever that module is inhibited, the outputs will go to zero (0).

The following examples are instances where you may need to use module inhibiting.

- Multiple controllers own the same digital input module. A change is required in the module's configuration; however, the change must be made to the program in all controllers. In this case, you can:
  a. Inhibit the module.
  b. Change configuration in all controllers.
  c. Uninhibit the module.

- You want to Flash upgrade a digital I/O module. We recommend you:
  a. Inhibit the module.
  b. Perform the upgrade.
  c. Uninhibit the module.

- You are using a program that includes a module that you do not physically possess yet, but you do not want the controller to continually look for a module that does not exist yet. In this case, you can inhibit the module in your program until it physically resides in the proper slot.

Use the System Clock to Timestamp Inputs and Schedule Outputs

Controllers generate a 64-bit coordinated system time (CST) for their respective chassis. The CST is a chassis-specific time that is not synchronized with, or in any way connected to, the time generated over the ControlNet network to establish a network update time (NUT), as described in Use RSNetWorx and RSLogix 5000 Software in Chapter 2.

You can configure your digital input modules to access the CST and timestamp input data with a relative time reference (that is, the value of the CST) of when that input data changes state.

IMPORTANT Because only one CST value is returned to the controller when any input point changes state, it is recommended that you use timestamping on only one input point per module.

The following table describes how you can use the system clock.

Use of Timestamping

Topic	Description	
Timestamping for a sequence of events	The CST can be used to establish a sequence of events occurring at a particular input module point by timestamping the input data. To determine a sequence of events, you must do the following: • Set the input module's communication format to: CST Timestamped Input Data • Enable Change of state for the input point where a sequence will occur (Disable COS for all other points on the module)	
	TIP	If you decide to configure multiple input points for COS, your module generates a unique CST each time any of those input points change state, as long as the changes do not occur within 500 µs of each other. If multiple input points configured for COS change state within 500 µs of each other, a single CST value is generated for all, making it appear that they changed at exactly the same time.

Use of Timestamping

Topic	Description
Timestamping in conjunction with scheduled outputs	Timestamping can be used in conjunction with the scheduled outputs feature so that after input data changes state and a timestamp occurs, an output point will actuate at some configured time in the future. You can schedule outputs up to 16 seconds into the future. When you use timestamping of inputs and scheduled outputs, you must: • choose a Communication Format for each input and output module that allows timestamping. See Communication Format for more information. • have a controller in the same rack as both I/O modules. • disable Change of State for all input points on the input module except the point being timestamped.
	TIP For scheduled outputs to work most effectively, remember the following items. • The time to schedule outputs to transition in the future must account for any controller, backplane, and network delays. • The I/O modules must reside in the same rack as the time master.

Time-scheduled Output Control

Time-scheduled output control is a feature available on the first eight outputs of the **1756-OB16IS module only**.

By using the time-scheduled output control feature, the module can turn the outputs On or Off at a specific CST time. You can set the time setpoint (in 100 µs increments) for the output to turn On or Off in the application program. The 1756-OB16IS module manages the time locally as such that the output is turned On or Off at the time specified.

MAOC Instructions with Time-scheduled Output Control

The Motion Axis Output Cam (MAOC) instruction provides position-based control of outputs, by using position and velocity information of any motion axis. When the 1756-OB16IS module is specified as the output source for the MAOC instruction, then the MAOC instruction automatically handles the time-based output scheduling and enables it on the first eight outputs on the 1756-OB16IS module. The benefit of using output scheduling in this manner is that the resolution of the output control is improved from the motion coarse update rate (typically 1…32 ms), to 100 µs.

You can also use the second eight outputs on the 1756-OB16IS module with the MAOC instruction. However, only the first eight outputs have 100 µs resolution. The second, eight outputs are updated at the motion coarse update rate.

Module Major Revision Considerations with Timestamping

When using timestamping for inputs or diagnostic timestamping of I/O modules, the following conditions may occur depending on the module's Major Revision.

- If the module has a Major Revision = 1, it will always return a positive timestamping value.
- If the module has a Major Revision > 2, it will return a negative timestamping value until the module is synchronized with the owner-controller and the first change of state condition occurs.

Look at the Module Properties dialog box of RSLogix 5000 software to determine if the module has been synchronized with the owner-controller and whether the controller is synchronized with the CST.

For more information on synchronizing owner-controllers and modules with the CST, see the ControlLogix System User Manual, publication 1756-UM001.

Producer/Consumer Model

By using the Producer/Consumer model, ControlLogix I/O modules can produce data without having been polled by a controller first. The modules produce the data and any other owner-controller device can decide to consume it.

For example, an input module produces data and any number of processors can consume the data at the same time. This eliminates the need for one processor to send the data to another processor. For a more detailed explanation of this process, see Input Module Operation.

Status Indicator Information

Each ControlLogix digital I/O module has a status indicator on the front of the module that lets you check the module health and operational status of a module. The status indicator displays vary for each module.

Status	Description	
I/O status ST	This yellow display indicates the On/Off state of the field device.	
	IMPORTANT	For the 1756-OA8D and 1756-OA8E modules, the I/O status indicator does not illuminate without field power applied.
Module status OK	This green display indicates the module's communication status.	
Fault status FLT	This display is only found on some modules and indicates the presence or absence of various faults.	
Fuse status Fuse	This display is only found on electronically fused modules and indicates the state of the module's fuse.	

See Appendix A for examples of status indicators on ControlLogix digital I/O modules.

Full Class I Division 2 Compliance

All ControlLogix digital I/O modules maintain CSA Class I Division 2 system certification. This allows the ControlLogix system to be placed in an environment other than only a 100% hazard free.

IMPORTANT Modules should not be pulled under power, nor should a powered RTB be removed, in a Class I Division 2 environment.

UL, CSA, FM, CE, C-Tick, Ex, TÜV Agency Approvals

Any ControlLogix digital I/O modules that have obtained UL, CSA, FM, CE, C-Tick, Ex, TÜV agency approval are marked as such. Ultimately, all digital modules will have these agency approvals and be marked accordingly.

Features Specific to Standard Input Modules

The features described in this section are available on all ControlLogix digital input modules.

Data Transfer on Either Cyclic Time or Change of State

Digital input modules always send data at the RPI, but they send data only at a change of state if the COS feature is enabled. COS is more efficient than RPI because it multicasts data only when a change occurs.

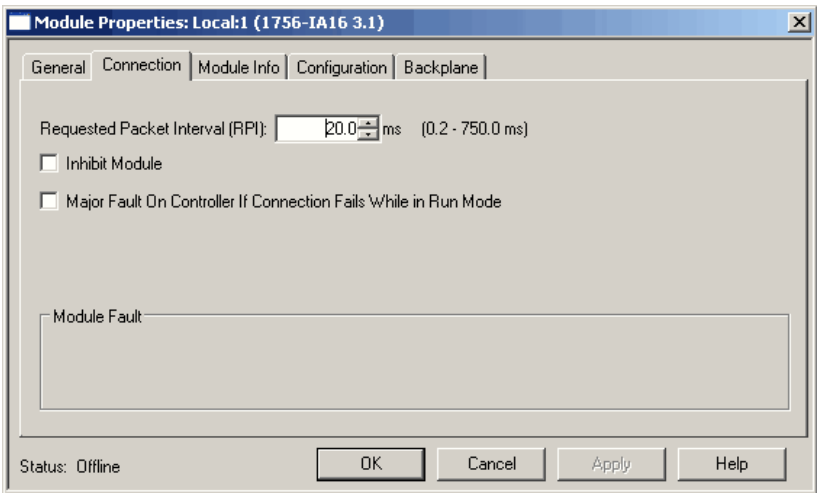
The table describes the two ways a module sends data to the owner-controller.

Topic	Description
Requested packet interval	A user-defined rate at which the module updates the information sent to its owner-controller. This is also known as Cyclic Data Transfer.
Change of state	Configurable feature that, when enabled, instructs the module to update its owner-controller with new data whenever a specified input point transitions from On to Off and Off to On. The data will be sent at the RPI rate when there is no change of state. By default, this setting is always enabled for input modules.

Set RPI

The Connection tab on the Module Properties dialog box lets you enter a requested packet interval (RPI). The RPI guarantees the slowest rate at which data is multicast to the owner-controller.

The module's actual data transfer rate may be faster than the RPI setting. But, the RPI provides a defined, maximum period of time when data is transferred to the owner-controller.



1. Choose from the options in the Connection tab.

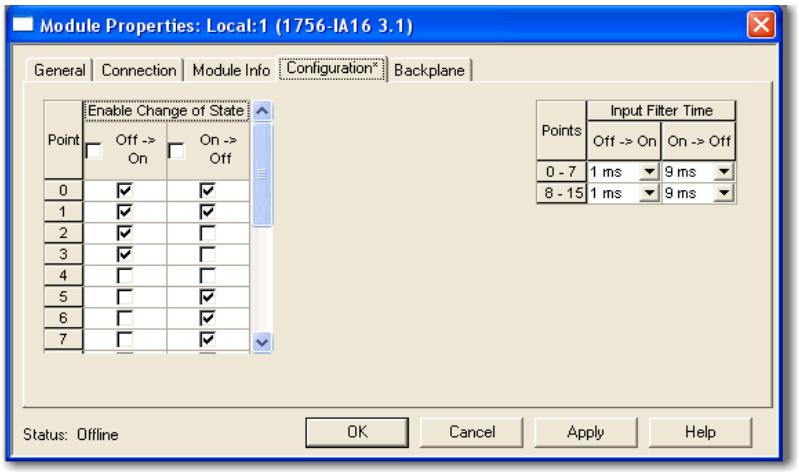
Field	Description
Requested Packet Interval (RPI)	Enter an RPI value or use the default.
Inhibit Module	Check the box to prevent communication between the owner-controller and the module. This option allows for maintenance of the module without faults being reported to the controller.
Major Fault On Controller If Connection Fails While in Run Mode	Check the box to create a major fault if there is a connection failure with the module while in Run mode. For important information on this checkbox, see 'Configure a Major Fault to Occur' in the Logix5000 Controllers Information and Status Programming Manual, publication 1756-PM015.
Module Fault	The fault box is empty if you are offline. The type of fault appears in the text box if a fault occurs when the module is online.

2. Click OK.

Enable Change of State

The Point column (on the left side of the Configuration tab) lets you determine whether a change of state occurs when a field device becomes Off to On or On to Off.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following:
   - Click a box to enable COS for a specific point for either Off to On or On to Off.
   - Clear the check mark to disable the COS for a specific point.

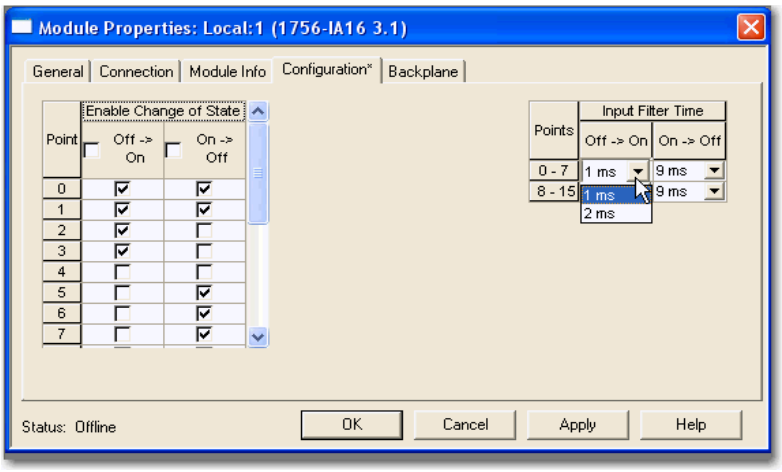
3. Click OK.

Software Configurable Filter Times

On to Off and Off to On filter times can be adjusted through RSLogix 5000 programming software for all ControlLogix input modules. These filters improve noise immunity within a signal. A larger filter value affects the length of delay times for signals from these modules.

Follow these steps to configure the input filter time.

1. On the right side of the Configuration tab, click the pull-down menu to choose the input filter times.



2. Click OK.

Isolated and Non-Isolated Varieties of Input Modules

ControlLogix input modules provide isolated or non-isolated wiring options. Some applications require power for the I/O circuits to originate on separate, isolated, power sources. Because these conditions require separate commons for each channel, some input modules use individual isolation, or point-to-point isolation so if one point faults, the others continue to operate.

Other types of isolation available with ControlLogix input modules are channel-to-channel isolation and no isolation. Your application determines what type of isolation is necessary and which input module to use.

Multiple Input Point Densities

ControlLogix input modules use either 8-, 16-, or 32-point densities for greater flexibility in your application. A point is the termination where a wire attaches to the input module from a field device. The module receives information from the device to this designated point, thus signaling when activity occurs.

Features Specific to Standard Output Modules

The features described in this section are available on all ControlLogix digital output modules.

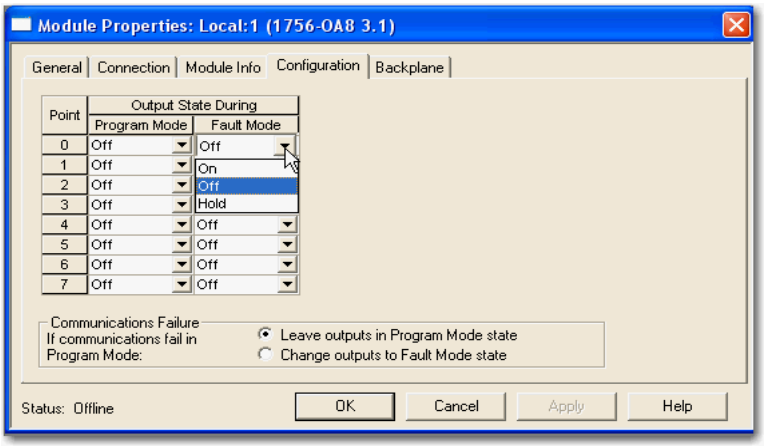
Configurable Point-Level Output Fault States

Individual outputs can be independently configured to unique fault states, either On, Off, or Hold in case of a communication failure or Program mode.

IMPORTANT Whenever you inhibit an output module, it enters the Program mode and all outputs change to the state configured for the Program mode. For example, if an output module is configured so that the state of the outputs turn off during Program mode, whenever that module is inhibited, the outputs will turn off.

Follow these steps to enable a fault state.

1. On the Module Properties dialog box, click the Configuration tab.



2. Click the pull-down arrow to choose the Fault mode.

3. Click OK.

Output Data Echo

During normal operation, when a processor sends out an output command to the ControlLogix system, the output module that is targeted for that command returns the commanded state of the output to the system. This process verifies that the module has received the command and will try to execute it.

Other devices can use this broadcast signal (through a listen-only connection) to determine the desired state of the output without having to interrogate the owner-controller.

Monitor Fault Bits

The Output Data Echo only matches the commanded state of the outputs if the module is operating under normal conditions. If there is an anomaly with the module, the commanded state and the Output Data Echo may not match.

You can monitor the fault bits for your output points for fault conditions. If a fault occurs, the fault bit is set and your program alerts you to the condition. In this case, the output data echo may not match the commanded state of the outputs.

If there is a mismatch between the commanded state of the outputs and the Output Data Echo, check your output module for the following conditions:

- Communications fault
- Connection is inhibited
- Blown fuse - Module will not turn on output if overload/short circuit is detected.
- Loss of field power (1756-OA8D and 1756-OA8E only) - Module will not turn On output if no AC power is detected.

Isolated and Non-Isolated Varieties of Output Modules

As with input modules, ControlLogix output modules provide isolated or non-isolated wiring options. I/O modules provide point-to-point, group-to-group, or channel-to-channel wiring isolation. Your specific application will determine what type of isolation is necessary and which output module to use.

IMPORTANT Although some ControlLogix I/O modules provide non-isolated field-side wiring options, each I/O module maintains internal electrical isolation between the system-side and field-side.

Multiple Output Point Densities

ControlLogix output modules use either 8-, 16-, or 32-point densities for greater flexibility in your application. A point is the termination where a wire attaches to the I/O module from a device. The I/O gets information from the device to this designated point, thus signaling when activity occurs.

Electronic Fusing

Some digital outputs have internal electronic or mechanical fusing to prevent too much current from flowing through the module. This feature protects the module from electrical damage. Other modules require external fusing.

You can reset an electronic fuse through RSLogix 5000 programming software or through ladder logic running on a controller. For an example of how to reset an electronic fuse, see Chapter 6.

The following modules use electronic fusing:

- 1756-OA8E
- 1756-OB8EI
- 1756-OB16E
- 1756-OV16E
- 1756-OV32E

See the table to determine what fuse to use in your application.

Recommended Fuses

Circuit Type	Cat. No.	Fusing on the module	Recommended Fuse	Fuse Supplier
AC	1756-OA8[1]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]	5x20mm 6.3A Medium lag	SAN-O Industry Corp. (SOC) p/n MT 4-6.3A
	1756-OA8E[2] [3]	Yes - Fused on a per point basis	Electronically fused	
	1756-OA16[1] [4] [5]	Yes - Fused on a per group basis	5x20mm 3.15A Slo-Blow 1500A Interruption current	Littelfuse p/n H2153.15
	1756-OA16I[1]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]	5x20mm 6.3A Medium lag	SOC p/n MT 4-6.3A
	1756-ON8	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]		
DC	1756-OB8[6]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]	5x20mm 4A Quick acting	SOC p/n MQ2-4A
	1756-OB81[6]			
	1756-OB8EI[2] [3] [6]	Yes - Fused on a per point basis	Electronically fused	
	1756-OB16E[2] [3] [6]	Yes - Fused on a per group basis		
	1756-OB16I[6] [7]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]	5x20mm 4A Quick acting	SOC p/n MQ2-4A
	1756-OB16IS[6] [7]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]		
	1756-OB32[6] [7]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]	5x20mm 800mA	Littelfuse p/n SP001.1003 or Schurter p/n 216.800

Recommended Fuses

Circuit Type	Cat. No.	Fusing on the module	Recommended Fuse	Fuse Supplier
DC	1756-OC8[6]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]	5x20mm 4A Quick acting	SOC p/n MQ2-4A
	1756-OG16[6]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]		
	1756-OH8I[6] [7]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]		
	1756-OV16E[2] [3] [6]	Yes - Fused on a per group basis	Electronically fused	
	1756-OV32E[2] [3] [6]	Yes - Fused on a per group basis		
Relay	1756-OW16I[7]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]	5x20mm 6.3A Medium lag	SOC p/n MT 4-6.3A
	1756-OX8I[7]	None - Fused IFM can be used to protect outputs (See publication 1492-TD008)[8]		

[1] For voltages above 132V AC, the Interface Modules (IFM) are not an acceptable means to provide external fusing. A rated terminal block for the intended application must be used.

[2] Electronic protection is not intended to replace fuses, circuit breakers, or other code required wiring protection devices.

[3] The electronic protection of this module has been designed to provide protection for the module from short circuit conditions. The protection is based on a thermal cut-out principle. In the event of a short circuit condition on an output channel, that channel will limit the current within milliseconds after its thermal cut-out temperature has been reached. All other channels with a NUT of that group will continue to operate as directed by the module master (CPU, Bridge, and so forth).

[4] A fuse is provided on each common of this module for a total of two fuses. The fuses are designed to protect the module from short circuit conditions. The fuse does not provide overload protection. In the event of an overload on an output channel, it is likely that the fuse will not blow and the output device associated with that channel will be damaged. To provide overload protection for your application, user supplied fuses should be externally installed.

[5] If a short circuit condition occurs on any channel within this module's group, the entire group is turned off.

[6] The module does not provide protection against reverse polarity wiring or wiring to AC power sources.

[7] The recommended fuse for this module has been sized to provide short circuit protection for wiring only to external loads. In the event of a short circuit on an output channel, it is likely that the transistor or relay associated with that channel will be damaged and the module should be replaced or a spare output channel used for the load. The fuse does not provide overload protection. In the event of an overload on an output channel, it is likely that the fuse will not blow and the transistor or relay associated with that channel will be damaged. To provide overload protection for your application, user supplied fuse should be installed externally and properly sized to match the individual load characteristics.

[8] The ControlLogix system has been agency certified using only the ControlLogix RTBs (1756-TBCH, 1756-TBNH, 1756-TBSH and 1756-TBS6H). Any application that requires agency certification of the ControlLogix system using other wiring termination methods may require application specific approval by the certifying agency.

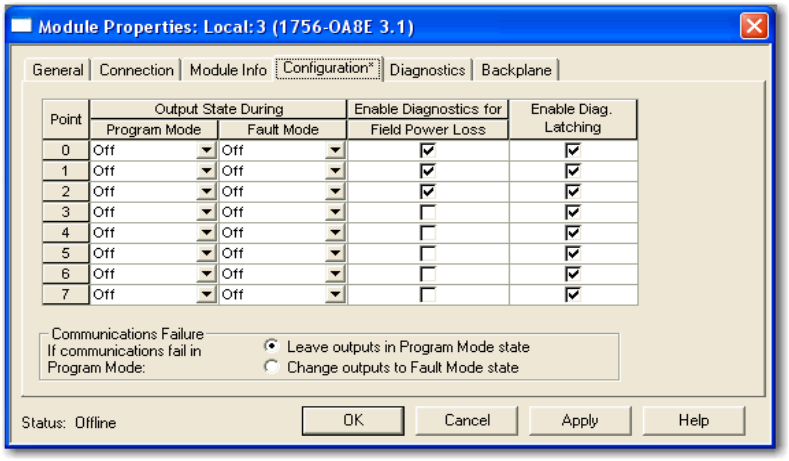
Field Power Loss Detection

For the standard digital output modules, the Field Power Loss detection feature is found on the **1756-OA8E only**. When field power to the module is lost, or zero cross cannot be detected, a point-level fault is sent to the controller to identify the exact point faulted.

IMPORTANT Only enable Field Power Loss detection for points that are in use. If this feature is enabled for points that are not in use, you will receive faults for those points during operation.

Follow these steps to enable diagnostics for field power loss.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following in the Enable Diagnostics for Field Power Loss column.
   - Click a box to enable field power loss detection for a specific point.
   - Clear the check mark to disable field loss detection.

3. Click OK.

Diagnostic Latch of Information

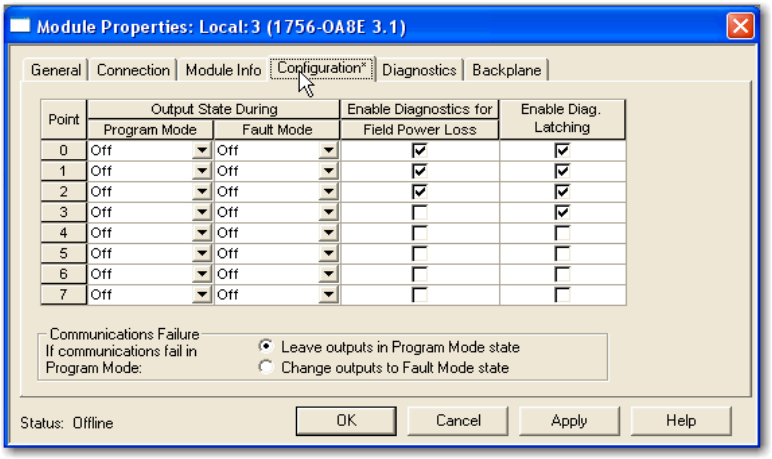
For the standard digital I/O modules, the diagnostic latch feature is found on the **1756-OA8E module only**. Diagnostic latching allows this module to latch a fault in the set position once it has been triggered, even if the error condition causing the fault to occur disappears.

Latched diagnostic features can be cleared by the Reset Diagnostic Latch service.

IMPORTANT Diagnostic latches are also reset through a software reset or when the I/O module's power is cycled.

Follow these steps to enable diagnostic latch of information.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following:
   - Click a box to enable diagnostic latching for a specific point.
   - Clear the check mark to disable diagnostic latching for a specific point.

3. Click OK.

Fault and Status Reporting Between Input Modules and Controllers

ControlLogix digital input modules multicast fault and status data to any owner-listening controllers. All input modules maintain a module-fault word, the highest level of fault reporting. Some output modules also use additional words to indicate fault conditions.

The table lists the tag that can be examined in ladder logic to indicate when a fault has occurred for a standard input module.

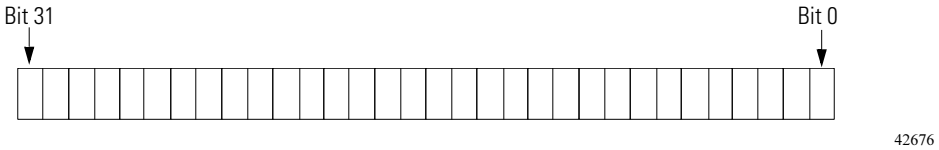
Tag	Description
Module-fault word	This word provides fault summary reporting. It's tag name is Fault. This word is available on all digital input modules.

All words are 32-bit, although only the number of bits appropriate for each module's density are used. For example, the 1756-IA16I module has a module-fault word of 32 bits. But, because this is a 16-point module, only 16 bits (bits 0…15) are used in the module-fault word.

Condition	Set Bits
Communications fault	All 32 bits are set to 1, regardless of the module's density.

The following illustration offers an overview of the fault reporting process on ControlLogix standard digital input modules.

Module-fault Word
All Modules



A communications fault sets all bits in the module-fault word.

Fault and Status Reporting Between Output Modules and Controllers

ControlLogix digital output modules multicast fault and status data to any owner-listening controllers. All output modules maintain a module-fault word, the highest level of fault reporting. Some modules also use additional words to indicate fault conditions.

The table lists the tags that can be examined in ladder logic to indicate when a fault has occurred for a standard output module.

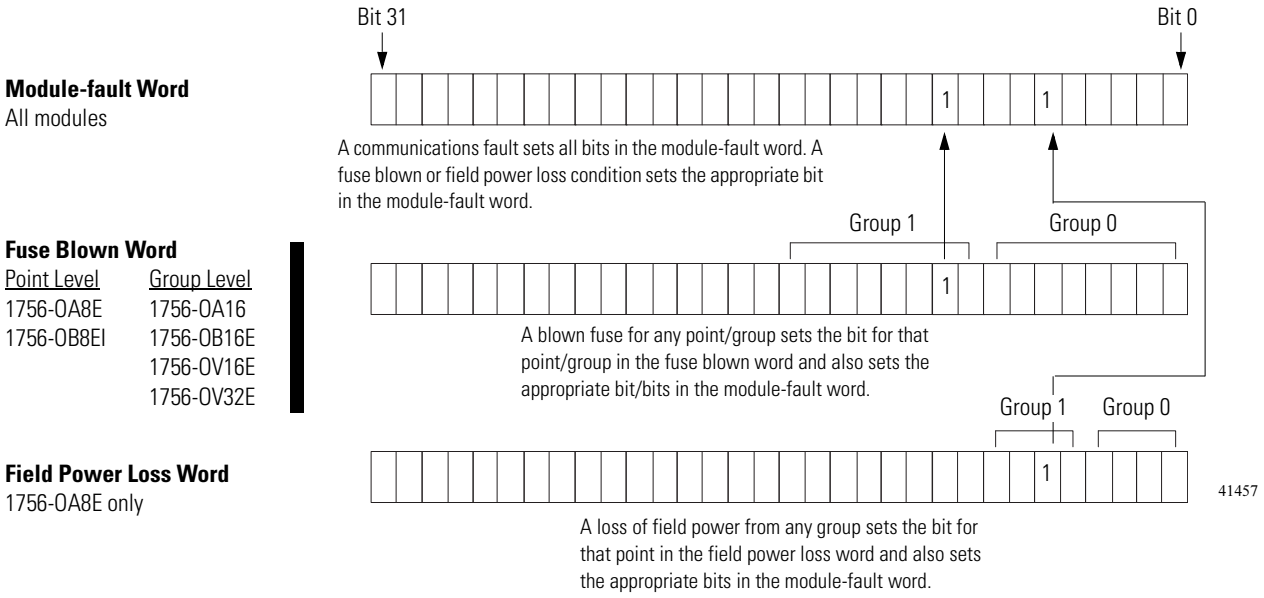
Tag	Description
Module-fault word	This word provides fault summary reporting. It's tag name is Fault. This word is available on all digital input modules.
Fuse blown word	This word indicates a point/group fuse blown on the module. It's tag name is FuseBlown. This word is available only on 1756-OA16, 1756-OA8E, 1756-OB16E, 1756-OB8EI, 1756-OV16E and 1756-OV32E modules. See Electronic Fusing for more information.
Field power loss word	This word indicates a loss of field power to a point on the module. It's tag name is FieldPwrLoss. This word is available on 1756-OA8E module. See Field Power Loss Detection for more information.

All words are 32-bit, although only the number of bits appropriate for each module's density are used. For example, the 1756-OB8 module has a module-fault word of 32 bits. But, because this is a eight-point module, only the first eight bits (bits 0…7) are used in the module-fault word.

Fault bits in the fuse blown word and field power loss word are logically entered into the module-fault word. In other words, depending on the module type, a bit set in the module-fault word can mean multiple things, as indicated in the following table.

Condition	Set Bits
Communications fault	All 32 bits are set to 1, regardless of the module's density.
Fuse blown	Only the bit affected is set to 1.
Field power loss	

The following illustration offers an overview of the fault reporting process on ControlLogix digital output modules.


Bit 31
Bit 0
Module-fault Word
All modules
1
1
A communications fault sets all bits in the module-fault word. A fuse blown or field power loss condition sets the appropriate bit in the module-fault word.
Group 1
Group 0
Fuse Blown Word
Point Level
Group Level
1756-OA8E
1756-OB8EI
1756-OA16
1756-OB16E
1756-OV16E
1756-OV32E
1
A blown fuse for any point/group sets the bit for that point/group in the fuse blown word and also sets the appropriate bit/bits in the module-fault word.
Group 1
Group 0
Field Power Loss Word
1756-OA8E only
1
41457
A loss of field power from any group sets the bit for that point in the field power loss word and also sets the appropriate bits in the module-fault word.

ControlLogix Diagnostic Digital I/O Module Features

Introduction

This chapter describes devices compatible with ControlLogix I/O and features that are specific to diagnostic digital I/O modules. Diagnostic digital I/O modules provide additional reporting information to the controller, such as a timestamp of the time a module fault occurs/clears, no load detection, and/or a pulse test.

Topic	Page
Diagnostic Input Module Compatibility	69
Diagnostic Output Module Compatibility	70
Features on ControlLogix Diagnostic Digital I/O Modules	70
Features Specific to Diagnostic Input Modules	78
Features Specific to Diagnostic Output Modules	82
Fault and Status Reporting Between Input Modules and Controllers	93
Fault and Status Reporting Between Output Modules and Controllers	95

Before proceeding, we suggest you take a few minutes to review a list of diagnostic digital I/O modules.

Cat. No.	Description
1756-IA8D	79…132V AC 8-point diagnostic input module
1756-IB16D	10…30V DC diagnostic input module
1756-OA8D	74…132V AC 8-point diagnostic output module
1756-OB16D	19.2…30V DC 16-point diagnostic output module

Diagnostic Input Module Compatibility

When designing a system by using ControlLogix diagnostic input modules, you must consider:

- the voltage necessary for your application.
- whether you need a solid state device.
- current leakage.
- if your application should use sinking or sourcing wiring.

For more information on compatibility of other Allen-Bradley Company products to ControlLogix input modules, see the I/O Products System Overview, publication CIG-SO001.

Diagnostic Output Module Compatibility

ControlLogix diagnostic digital outputs are capable of directly driving the ControlLogix diagnostic digital inputs. When diagnostics are used, a shunt resistor is required for leakage current.

For more information on the compatibility of motor starters to ControlLogix output modules, see Appendix E.

Features on ControlLogix Diagnostic Digital I/O Modules

The table below lists features on ControlLogix diagnostic digital I/O modules. The features are described later in this section.

IMPORTANT Some of the features described in this section are not available on all ControlLogix diagnostic digital I/O modules. The following table lists which modules support each feature.

Topic	Page	Available Modules
Removal and Insertion Under Power (RIUP)	71	All diagnostic digital input and output modules
Module Fault Reporting	71	
Software Configurable	72	
Electronic Keying	72	
Use the System Clock to Timestamp Inputs and Schedule Outputs	72	
Producer/Consumer Model	73	
Status Indicator Information	73	
Full Class I Division 2 Compliance	74	
UL, CSA, FM, CE, C-Tick, EEx, TÜV Agency Approvals	74	
Diagnostic Latch of Information	74	
Diagnostic Timestamp	75	
8-Point AC/16-Point DC	75	
Point-level Fault Reporting	76	
Software Configurable Filter Times	79	Diagnostic digital input modules
Isolated and Non-Isolated Varieties of Modules	80	
Multiple Input Point Densities	80	
Open Wire Detection	80	
Diagnostic Change of State for Input Modules	78	
Field-power Loss Detection on Input Modules	81	1756-IA8D

Topic	Page	Available Modules
Configurable Point-level Output Fault States	82	Diagnostic digital output modules
Output Data Echo	83	
Field Wiring Options	84	
Multiple Input Point Densities	80	
Electronic Fusing	85	
No Load Detection	86	
Field-side Output Verification	87	
Pulse Test	89	
Point-level Electronic Fusing	91	
Field-power Loss Detection on Output Modules	92	
Diagnostic Change of State for Output Modules	93	

Features Common to ControlLogix Diagnostic Digital I/O Modules

The features described in this section are available on all ControlLogix diagnostic digital I/O modules.

Removal and Insertion Under Power (RIUP)

All ControlLogix I/O diagnostic modules may be inserted and removed from the chassis while power is applied. This feature allows greater availability of the overall control system because, while the module is being removed or inserted, there is no additional disruption to the rest of the controlled process.

Module Fault Reporting

ControlLogix diagnostic digital I/O modules provide both hardware and software indication when a module fault has occurred. Each module's fault status indicator and the RSLogix 5000 programming software will graphically display this fault and include a fault message describing the nature of the fault.

This feature lets you determine how your module has been affected and what action should be taken to resume normal operation.

Software Configurable

The RSLogix 5000 programming software uses a custom, easily understood interface to write configuration. All module features are enabled or disabled through the I/O configuration portion of the software.

You also can use the software to interrogate any module in the system to retrieve:

- serial number.
- firmware revision information.
- product code.
- vendor.
- error/fault information.
- diagnostic counters.

By eliminating such tasks as setting hardware switches and jumpers, the software makes module configuration easier and more reliable.

Electronic Keying

See Electronic Keying on page 44 for details.

Module Inhibiting

See Module Inhibiting on page 51 for details.

Use the System Clock to Timestamp Inputs and Schedule Outputs

Controllers generate a 64-bit coordinated system time (CST) for their respective chassis. The CST is a chassis-specific time that is not synchronized with, or in any way connected to, the time generated over the ControlNet network to establish a network update time (NUT), as described in Use RSNetWorx and RSLogix 5000 Software in Chapter 2.

See page 52 for a table that describes how to you the system clock.

Module Major Revision Considerations with Timestamping

When using timestamping for inputs or diagnostic timestamping of I/O modules, remember the following conditions that may occur depending on the module's Major Revision.

- If the module has a Major Revision = 1, it will always return a positive timestamping value.
- If the module has a Major Revision > 2, it will return a negative timestamping value until the module is synchronized with the owner-controller and the first Change of State condition occurs.

Look at the Module Properties dialog box of RSLogix 5000 software to determine if the module has been synchronized with the owner-controller and whether the controller is synchronized with the CST.

For more information on synchronizing owner-controllers and modules with the CST, see the ControlLogix System User Manual, publication 1756-UM001.

Producer/Consumer Model

By using the Producer/Consumer model, ControlLogix I/O modules can produce data without having been polled by a controller first. The modules produce the data and any other owner-controller device can decide to consume it.

For example, a diagnostic input module produces data and any number of processors can consume the data at the same time. This eliminates the need for one processor to send the data to another processor.

For a more details, see Input Module Operation in Chapter 2.

Status Indicator Information

Each ControlLogix diagnostic digital I/O module has a status indicator on the front of the module that lets you check the module health and operational status of a module. The status indicator displays vary for each module.

For examples of status indicators on ControlLogix digital I/O modules, see Appendix A.

Full Class I Division 2 Compliance

All ControlLogix digital I/O modules maintain CSA Class I Division 2 system certification. This allows the ControlLogix system to be placed in an environment other than only a 100% hazard free.

IMPORTANT Modules should not be pulled under power, nor should a powered RTB be removed, in a Class I Division 2 environment.

UL, CSA, FM, CE, C-Tick, EEx, TÜV Agency Approvals

Any ControlLogix digital I/O modules that have obtained UL, CSA, FM, CE, C-Tick, EEx, TÜV agency approval are marked as such. Ultimately, all digital modules will have these agency approvals and be marked accordingly.

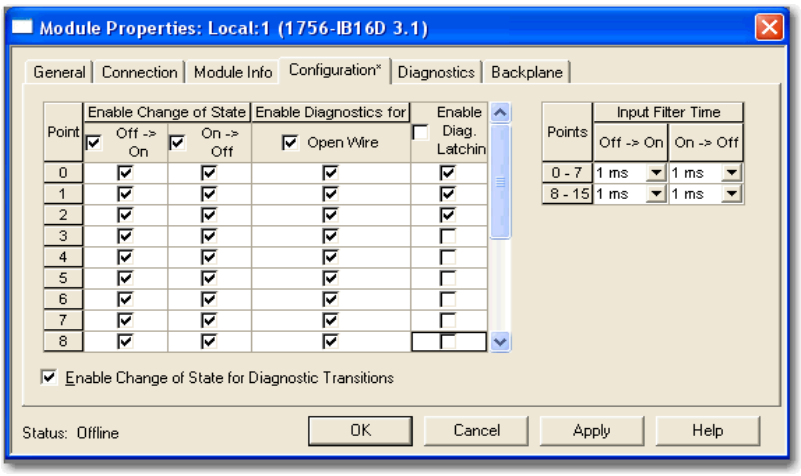
Diagnostic Latch of Information

Diagnostic latching allows diagnostic I/O modules to latch a fault in the set position once it has been triggered, even if the error condition causing the fault to occur disappears.

IMPORTANT Latched diagnostic features can be cleared by the Reset Diagnostic Latch service. Diagnostic latches are also reset through a software reset or when the I/O module's power is cycled.

The Point column (on the left side of the Configuration tab) lets you set diagnostic latching to occur for a specific point where the field device is wired to the I/O module.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following:
   - Click a box to enable diagnostic latching for a specific point.
   - Clear the check mark to disable diagnostic latching for a specific point.

3. Click OK.

Diagnostic Timestamp

Diagnostic I/O modules can timestamp the time when a fault occurs or when it clears. This feature provides greater accuracy and flexibility in running applications. Modules use the ControlLogix system clock from a local controller to generate timestamps.

To use diagnostic timestamps, you must choose the appropriate Communication Format during initial configuration. For more information on choosing a Communication Format on page 117.

8-Point AC/16-Point DC

Diagnostic ControlLogix digital I/O modules provide various grouping of points on different modules. The eight-point AC modules and 16-point DC modules provide additional flexibility when designing module applications. The greater number of points allows for more field devices to be attached to I/O modules to boost efficiency.

Point-level Fault Reporting

Diagnostic I/O modules set bits to indicate when a fault has occurred on a point-by-point basis. The following fault conditions generate their own unique fault bits.

Unique Fault Bits for I/O Points

	Input points	Output points
Conditions setting a fault bit	Open wire Field power loss (1756-IA8D only)	Fuse blown No load Output verify Field power loss (1756-IA8D only)

Using these bits in tandem with 'data echo' and manually performing a pulse test can help to further isolate the fault. The following table lists possible diagnostic faults on the 1756-OA8D module.

1756-OA8D Diagnostic Fault Table

Ladder commands output to be On	Ladder commands output to be Off	Possible cause of fault
1. Output Data Echo returns the state of the output as Off. 2. Fuse Blown bit is set.	1. Output Data Echo returns the state of the output as Off.(4) 2. Pulse Test fails.	Output is shorted to L2.
1. Output Data Echo returns the state of the output as On. 2. Pulse Test fails.(1)	1. Output Data Echo returns the state of the output as Off. 2. No Load bit is off.	No Load or output is shorted to L1.
1. Output Data Echo returns the state of the output as Off. 2. No Load shows a fault. 3. Field Power Loss shows a fault. 4. Pulse Test fails.	1. Output Data Echo returns the state of the output as Off. 2. No Load bit is set. 3. Field Power Loss is set. 4. Pulse Test fails.	L1 or L2 are disconnected or outside the 47-63 Hz frequency range.
1. Output Data Echo returns the state of the output as On.(2) 2. Output Verify bit is set.(3)	1. Data Echo returns the state of the output as Off. 2. Pulse Test fails.	Hardware point damage.(5)

(1) When pulse test is executed, it is normal operation to see a momentary pulsation on the module display.

(2) The output cannot turn On due to hardware point damage.

(3) Depending on the characteristics of an applied short-circuit, an output verify fault could be set until the short- circuit is detected by the module and the output is turned Off.

(4) It is not possible to create a fuse blown fault in the Off state. If a short-circuit occurs, the output point is turned Off and the fault appears in the Off state until the point is reset.

(5) During normal operating conditions, hardware damage should not be possible. An output shorted to L2 may temporarily cause a hardware point fault. See output shorted to L2 as a possible cause.

The following table lists possible diagnostic faults on the 1756-OB16D module.

1756-OB16D Diagnostic Fault Table

Ladder commands output to be On	Ladder commands output to be Off	Possible cause of fault
1. Output Data Echo returns the state of the output as Off. 2. Fuse Blown bit is set.(1)	1. Output Data Echo returns the state of the output as Off.(4) 2. Pulse Test fails.(5)	Output is shorted to GND.
1. Output Data Echo returns the state of the output as On. 2. Pulse Test fails	1. Output Data Echo returns the state of the output as Off. 2. No Load bit is set. 3. Pulse Test passes.	One of the following could be the cause. 1. No Load. 2. Output shorted to DC+. 3. No power at module.
1. Output Data Echo returns the state of the output as On.(2) 2. Output Verify sets a bit.(3)	1. Output Data Echo returns the state of the output as Off. 2. Pulse Test fails.	Hardware point damage.(6)

(1) The electronic protection of this module has been designed to provide protection for the module from short-circuit conditions. The protection is based on a thermal cutout principal. In the event of a short-circuit condition on an output channel, that channel will limit the current within milliseconds after its thermal cutout temperature has been reached. Other channels could produce a false error on the output verify fault signal due to the supply dropping below the minimum detect level of 19.2V DC. The output channels that are affected by this phenomena will continue to operate as directed by the module master (CPU, bridge, and so forth). What this means is that the output verify fault signals of the other channels should be checked and reset if a short-circuit on one channel occurs.

(2) The output cannot turn On due to hardware point damage.

(3) Depending on the characteristics of an applied short-circuit, an output verify fault could be set until the short- circuit is detected by the module and the output is turned Off.

(4) It is not possible to create a fuse blown fault in the Off state. If a short-circuit occurs, the point is turned Off and the fault appears in the Off state until that point is reset.

(5) When the pulse test is executed, it is normal operation to see a momentary pulsation on the module display.

(6) During normal operating conditions, hardware damage should not be possible. An output shorted to GND may temporarily cause a hardware point fault. See output shorted to GND as a possible cause.

Features Specific to Diagnostic Input Modules

The features described in this section are available on all ControlLogix diagnostic digital input modules.

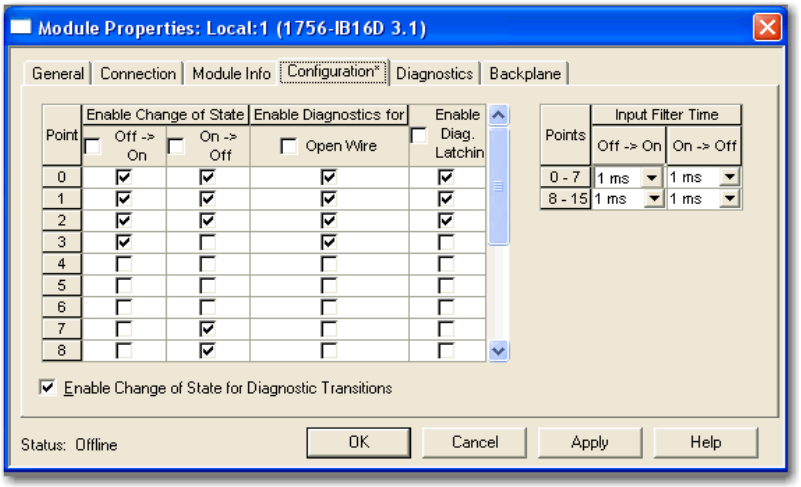
Diagnostic Change of State for Input Modules

If the diagnostic change of state feature is enabled, a diagnostic input module sends new data to the owner-controller when one of the events described in the table occurs.

Topic	Description
Requested packet interval	A user-defined rate at which the module updates the information sent to its owner-controller. This is also known as Cyclic Data Transfer.
Change of state	Configurable feature that, when enabled, instructs the module to update its owner-controller with new data whenever a specified input point transitions from On to Off and Off to On. The data will be sent at the RPI rate where there is no change of state. By default, this setting is always enabled for input modules.
Diagnostic Change of State	Information updates when any change in the diagnostics for an input module occurs.

Although the RPI occurs continuously, this COS feature lets you to decide whether changes in a module's diagnostic detection should cause the module to send real time data to the owner-controller.

1. On the Module Properties dialog box, click the Configuration tab.



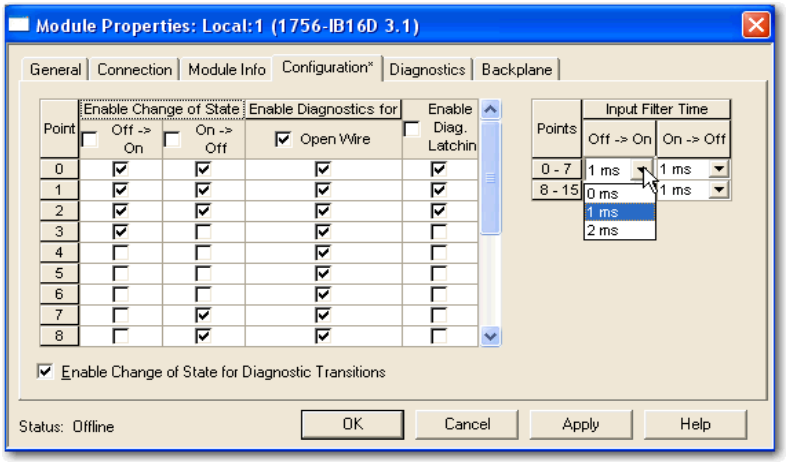
2. Do the following to enable or disable the COS feature.
   - Click the box to enable the input module to send new data to the owner-controller at the RPI, on input COS if it is enabled, and if a diagnostic fault occurs.
   - Clear the check mark to disable the feature. Real time data is not sent when a diagnostic fault occurs but is still sent at the specified RPI or on input COS if it is enabled.
3. Click OK.

Software Configurable Filter Times

On to Off and Off to On filter times can be adjusted through RSLogix 5000 software for all ControlLogix input modules. These filters improve noise immunity within a signal. A larger filter value affects the length of delay times for signals from these modules.

Follow these steps to configure the input filter time.

1. On the right side of the Configuration tab, click the pull-down menu to choose the input filter times.



2. Click OK.

Isolated and Non-Isolated Varieties of Modules

ControlLogix diagnostic input modules provide isolated or non-isolated wiring options. Some applications require power for the I/O circuits to originate on separate, isolated, power sources. Because these conditions require separate commons for each channel, some input modules use individual isolation, or point-to-point isolation.

Other types of isolation available with ControlLogix diagnostic input modules are channel-to-channel isolation and no isolation. Your specific application will determine what type of isolation is necessary and which input module to use.

Multiple Input Point Densities

ControlLogix diagnostic input modules use either 8- or 16-point densities for greater flexibility in your application.

Open Wire Detection

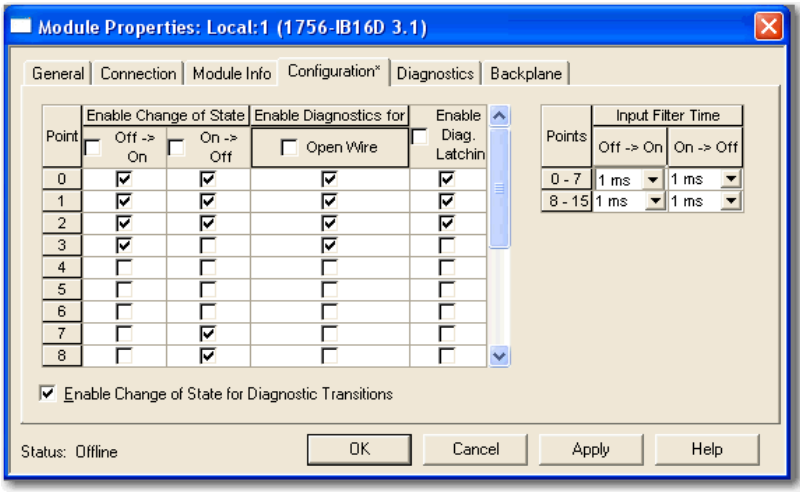
Open Wire is used to verify the field wiring is connected to the module. The field device must provide a minimum leakage current to function properly.

A leakage resistor must be placed across the contacts of an input device. See each module's specifications, listed in Chapter 7, for more details. The resulting current is then expected to exist when the input is open.

When an Open Wire condition is detected, a point-level fault is sent to the controller to identify the exact point fault. This feature has a corresponding tag that can be examined in the user program in the event of a fault.

Follow these steps to configure open wire detection.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following in the Open Wire (middle) column.
   - Click a box to enable the open wire detection for a specific point.
   - Clear the check mark to disable open wire detection.

3. Click OK.

Field-power Loss Detection on Input Modules

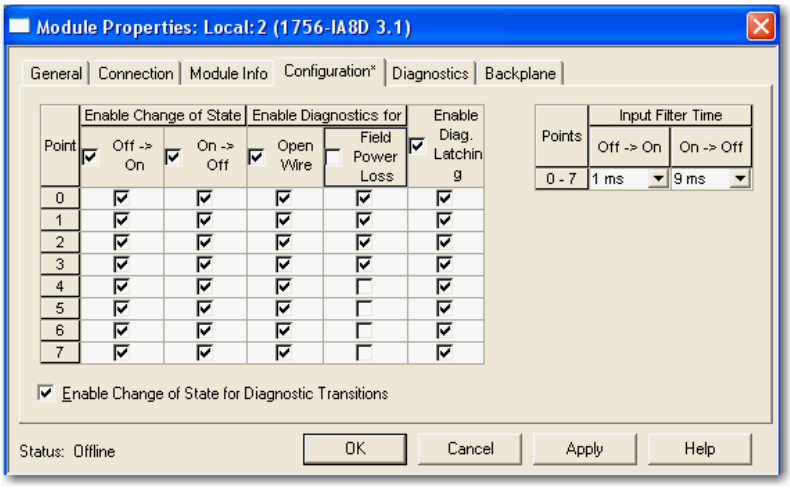
For the diagnostic input modules, field-power loss detection is found on the **1756-IA8D module only**. When field power to the module is lost, a point level fault is sent to the controller to identify the exact point faulted. You should enable field-power loss detection only for points that are in use.

This feature has a corresponding tag that can be examined in the user program in the event of a fault.

For more information on these tags, see Appendix B.

Follow these steps to enable or disable field-power loss detection.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following in the field-power loss column.
   - Click the box to enable the feature specific point.
   - Clear the check mark to disable the feature for a specific point.

3. Click OK.

Features Specific to Diagnostic Output Modules

The features described in this section are available on all ControlLogix diagnostic digital output modules.

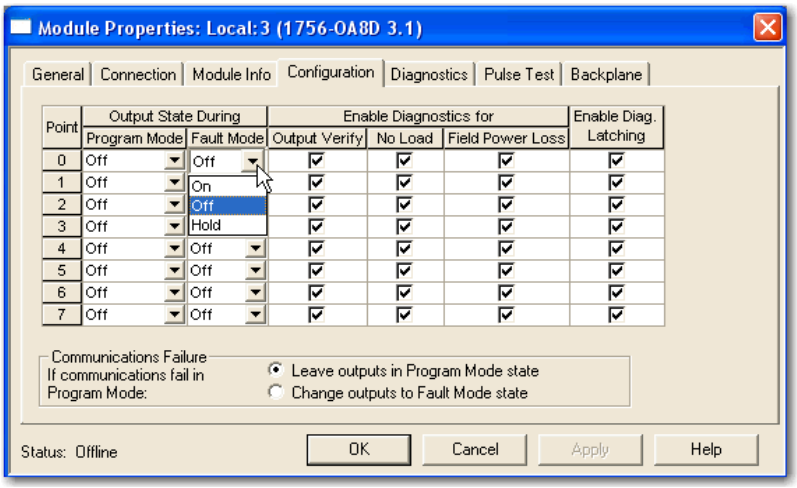
Configurable Point-level Output Fault States

Individual outputs can be independently configured to unique fault states, either On, Off, or Hold in case of a communication failure or Program mode.

IMPORTANT Whenever you inhibit a diagnostic output module, it enters the Program mode and all outputs change to the state configured for the Program mode. For example, if an output module is configured so that the state of the outputs turn off during Program mode, whenever that module is inhibited, the outputs will turn off.

Follow these steps to configure the output fault state for a selected module.

1. On the Module Properties dialog box, click the Configuration tab.



2. Click the pull-down menu to choose the fault state.

   Make sure you choose the correct set point where the field device is wired to the module.

3. Click OK.

Output Data Echo

During normal operation, when a processor sends out an output command to the ControlLogix system, the diagnostic output module that is targeted for that command returns the commanded state of the output to the system. This process verifies that the module has received the command and will try to execute it.

Other devices can use this broadcast signal (through a listen-only connection) to determine the desired state of the output without having to interrogate the owner-controller.

This feature cannot relay to the system that the field-side device connected to the output module has executed the command.

Refer to Field-side Output Verification on page 87 if your application requires a more detailed response than only acknowledging the receipt of a command.

Monitor Fault Bits

The Output Data Echo only matches the commanded state of the outputs if the module is operating under normal conditions. If there is an anomaly with the module, the commanded state and the Output Data Echo may not match.

You can monitor the fault bits for your output points for fault conditions. If a fault occurs, the fault bit is set and your program alerts you to the condition. In this case, the output data echo may not match the commanded state of the outputs.

If there is a mismatch between the commanded state of the outputs and the Output Data Echo, check your diagnostic output module for the following conditions:

- Communications fault.
- Connection inhibited.
- Blown fuse - Module will not turn on output if overload/short circuit is detected.
- Loss of field power (1756-OA8D and 1756-OA8E only) - Module will not turn on output if no AC power is detected.

Field Wiring Options

As with diagnostic input modules, ControlLogix diagnostic output modules provide isolated or non-isolated wiring options. I/O modules provide point-to-point, group-to-group, or channel-to-channel wiring isolation.

Your specific application determines what type of isolation is necessary and which output module to use.

IMPORTANT Although some ControlLogix diagnostic I/O modules provide non-isolated, field-side wiring options, each I/O module maintains internal electrical isolation between the system-side and field-side.

Multiple Output Point Densities

ControlLogix diagnostic output modules use either 8- or 16-point densities for greater flexibility in your application.

Electronic Fusing

Diagnostic digital outputs have internal electronics to prevent too much current from flowing through the module. This feature protects the module from electrical damage.

You can reset an electronic fuse through RSLogix 5000 configuration software or by using ladder logic running on a controller. For an example of how to reset an electronic fuse, see Output Online Services on page 129.

Recommended Fuses

Circuit Type	Cat. No.	Fusing on the Module	Recommended Fuse
AC	1756-OA8D(1) (2)	Yes - Fused on a per point basis	Electronically fused
DC	1756-OB16D(1) (2) (3)	Yes - Fused on a per point basis	Electronically fused

(1) Electronic protection is not intended to replace fuses, circuit breakers, or other code required wiring protection devices.

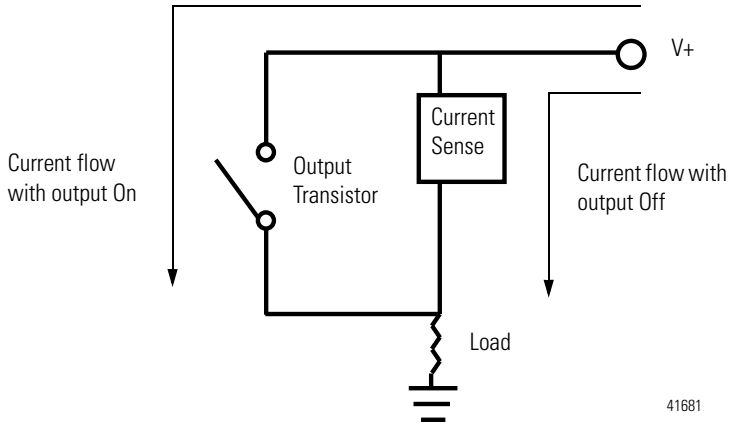
(2) The electronic protection of this module has been designed to provide protection for the module from short-circuit conditions. The protection is based on a thermal cut-out principle. In the event of a short-circuit condition on an output channel, that channel will limit the current within milliseconds after its thermal cut-out temperature has been reached. All other channels will continue to operate as directed by the module master (CPU, Bridge, and so forth).

(3) The electronic protection of this module has been designed to provide protection for the module from short-circuit conditions. The protection is based on a thermal cut-out principle. In the event of a short-circuit condition on an output channel, that channel will limit the current within milliseconds after its thermal cut-out temperature has been reached. Other channels could produce a false error on the output verify fault signal due to the supply dropping below the minimum detect level of 19.2V DC. The output channels that are affected by this phenomena will continue to operate as directed by the module master (CPU, Bridge, and so forth). What this means is that the output verify fault signals of the other channels should be checked and reset if a short-circuit on one channel occurs.

No Load Detection

For each output point, no load detects the absence of field wiring or a missing load from each output point in the Off-state only.

The output circuit on a diagnostic output module has a current sensing optoisolator used in parallel with the output transistor. Current flows through this sensing circuit only when the output is Off, as shown in the simplified diagram.

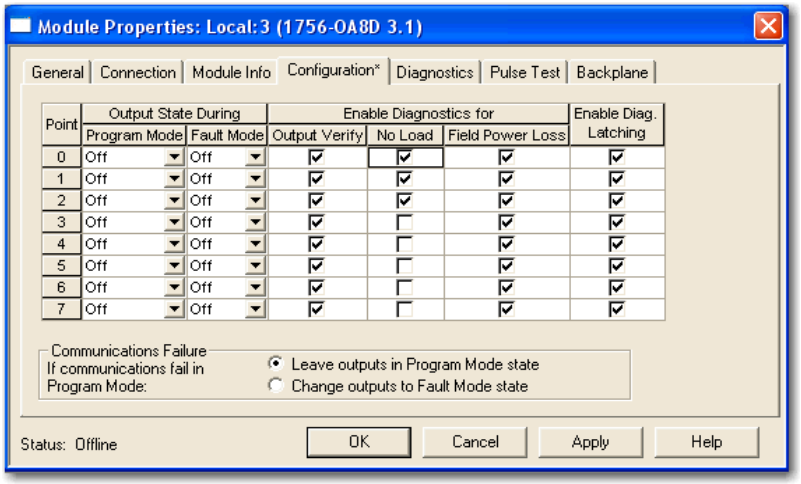


Diagnostic output modules list a minimum load current specification (1756-OA8D = 10 mA & 1756-OB16D = 3 mA). In the On-state, the module must be connected to a load that will draw a minimum current equal to these values.

If a connected load is sized in accordance with the minimum load current specification, diagnostic output modules are capable of sensing current through the optoisolator and the load when the output point is Off.

Follow these steps to enable no load detection.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following in the No Load column.
   - Click the box to enable the feature for a specific point.
   - Clear the check mark to disable the feature for a specific point.

3. Click OK.

This feature has a corresponding tag that can be examined in the user program in the event of a fault. For more information on these tags, see Appendix B.

Field-side Output Verification

Field-side output verification informs you that logic side instructions that the module consumes are accurately represented on the power side of a switching device. In other words, for each output point, this feature confirms that the output is On when it is commanded to be On.

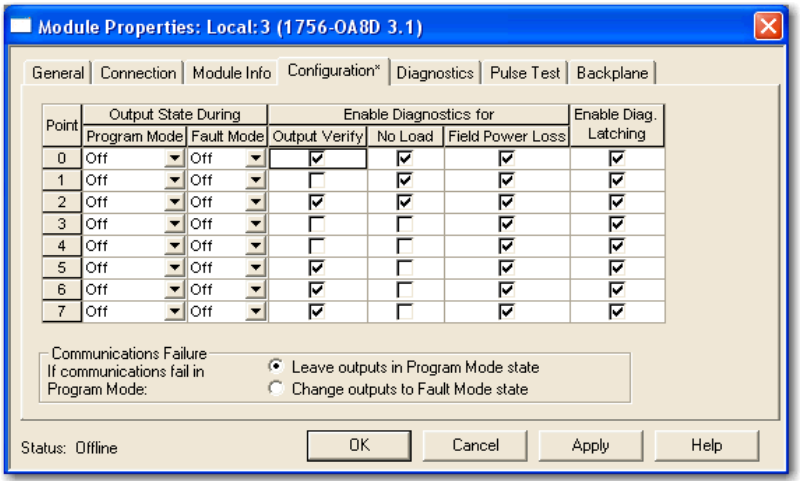
The diagnostic output module can tell a controller that it received a command and whether the field-side device connected to the module has executed the command. For example, in applications that need to verify that the module has accurately followed the processor's instructions, the module samples the field-side state and compares it to the system-side state.

This feature has a corresponding tag that can be examined in the user program in the event of a fault. For more information on these tags, see Appendix B.

If an output cannot be verified, a point-level fault is sent to the controller.

Follow these steps to enable the field-side output verification.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following in the Output Verify column.
   - Click the box to enable the feature for a specific point.
   - Clear the check mark to disable the feature for specific point.

3. Click OK.

Pulse Test

Pulse test is a feature found on diagnostic output modules that can verify output-circuit functionality without actually changing the state of the output load device. A short pulse is sent to the targeted output circuit. The circuit should respond as it would if a real change-of-state command was issued, but the load device does not transition.

See page 273 in Appendix C for performing a pulse test with a CIP Generic Message instruction.

TIP

Consider the following when using the pulse test.

- Only use the test when the output state does not transition for long periods of time. Normal diagnostics will catch faults if the outputs are transitioning regularly.
- When first performing the pulse test, it is recommended that you verify the load will not transition. You should be at the actual load while the test is performed.

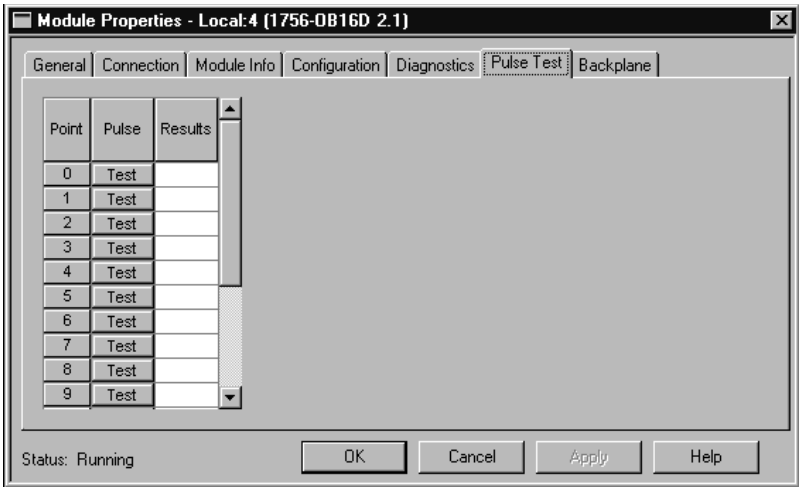
The table explains how a pulse test can be used to perform a preemptive diagnosis of possible future module conditions.

Topic	Description
Detect a blown fuse before it happens.	The Blown Fuse diagnostic (see page 85 for a complete explanation) can be used only when an output module is in the On state. But it would be useful to be made aware when operating conditions for a module may cause a blown fuse. If you perform a pulse test on the module while the output is in the Off state, the output point is commanded to be On briefly. Although no diagnostic bits are set in the output data echo, the pulse test reports a failure because conditions when the point is On indicate a blown fuse condition may occur (see Point-level Fault Reporting on page 76). **IMPORTANT** The pulse test does not guarantee a fuse will blow when the output point turns On. It merely indicates this condition is possible.

Topic	Description
Detect a No Load condition with an output On.	The No Load diagnostic (see page 86) can only detect a fault (that is, set the No Load bit) when an output point is in the Off state. But you may find it useful to be made aware when operating conditions for that point may reveal a potential No Load condition. If you perform a pulse test on an output point while it is in the On state, the output point is commanded to be Off briefly. The pulse test reports a failure because conditions when the point is Off indicate the possible absence of a field device; in this case, though, the No Load bit will not be set (see Point-level Fault Reporting on page 76). **IMPORTANT** The Pulse Test does not guarantee the absence of a load. It merely indicates this condition is possible.

Follow these steps to perform a pulse test by using RSLogix 5000 software. Your project must be online for you to perform the pulse test.

1. On the Module Properties dialog box, click the Pulse Test tab.



2. Click Test for a particular point on the module to perform a pulse test.

3. Click OK.

Point-level Electronic Fusing

Diagnostic output modules use electronic fusing to protect output points from the surge of too much current through that point on the module. If too much current begins to flow through a point, the fuse is tripped and a point-level fault is sent to the controller.

You can reset an electronic fuse through RSLogix 5000 programming software or through ladder logic running on a controller.

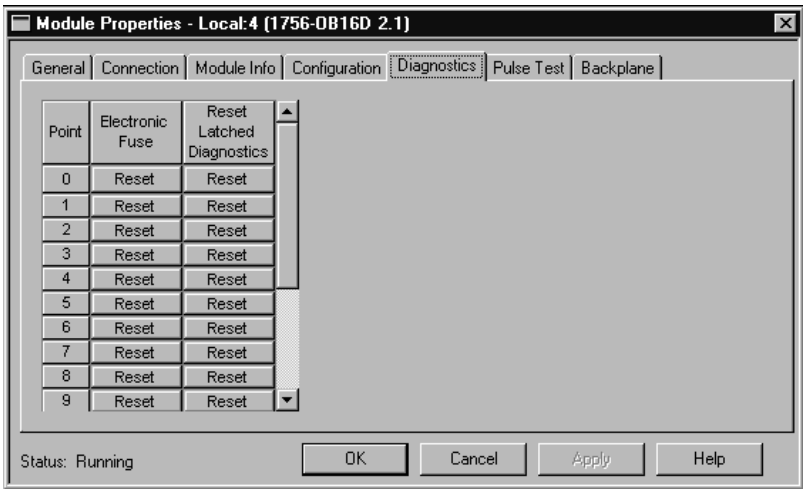
See page 273 in Appendix C for performing a fuse reset with a CIP Generic Message instruction.

This feature has a corresponding tag that can be examined in the user program in the event of a fault.

For more information on these tags, see page 249.

Follow these steps to reset a fuse for a point on a module.

1. On the Module Properties dialog box, click the Diagnostics tab.



2. Click Reset for a particular point on the module to reset a fuse.

3. Click OK.

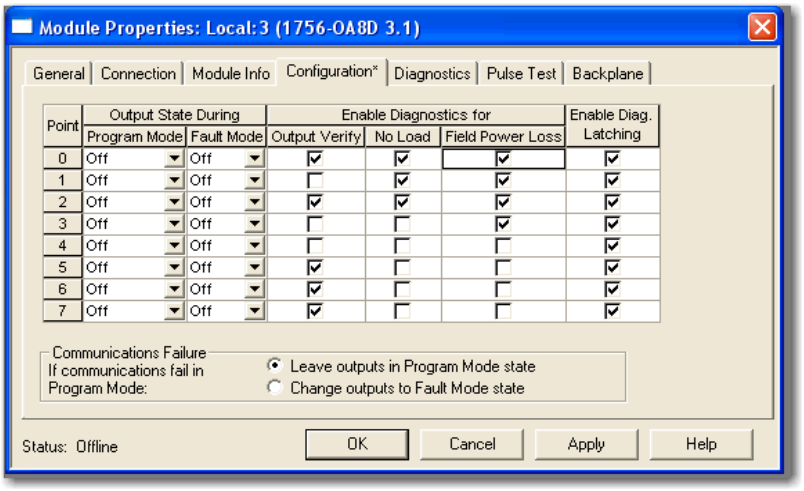
Field-power Loss Detection on Output Modules

This feature is used when field power to the output module is lost or zero cross cannot be detected. A point-level fault is sent to the controller to identify the exact point faulted.

IMPORTANT Only enable field-power loss detection for points that are in use. If this feature is enabled for points that are not in use, you will receive faults for those points during operation.

Follow these steps to enable or disable field-power loss detection.

1. On the Module Properties dialog box, click the Configuration tab.



2. Do one of the following in the Field Power Loss column.
   - Click the box to enable the feature for a specific point.
   - Clear the check mark to disable the feature for a specific point.

3. Click OK.

Diagnostic Change of State for Output Modules

If the Diagnostic Change of State feature is enabled, a diagnostic output module sends new data to the owner-controller when one of the events described in the table occurs.

Topic	Description
Receipt of output data	Output module sends data when it echoes back to the owner-controller.
Diagnostic change of state	Output module sends data when any change in the diagnostics output point occurs.

Unlike diagnostic input modules, this feature cannot be disabled for diagnostic output modules. There is no 'Enable Change of State for Diagnostic Transitions' box at the bottom of the Configuration tab to check or uncheck for diagnostic output modules.

Fault and Status Reporting Between Input Modules and Controllers

ControlLogix diagnostic digital input modules multicast fault and status data to any owner-listening controllers.

All diagnostic input modules maintain a module-fault word, the highest level of fault reporting. Some modules also use additional words to indicate fault conditions.

The following table lists the tags that can be examined in ladder logic to indicate when a fault has occurred for a diagnostic input module.

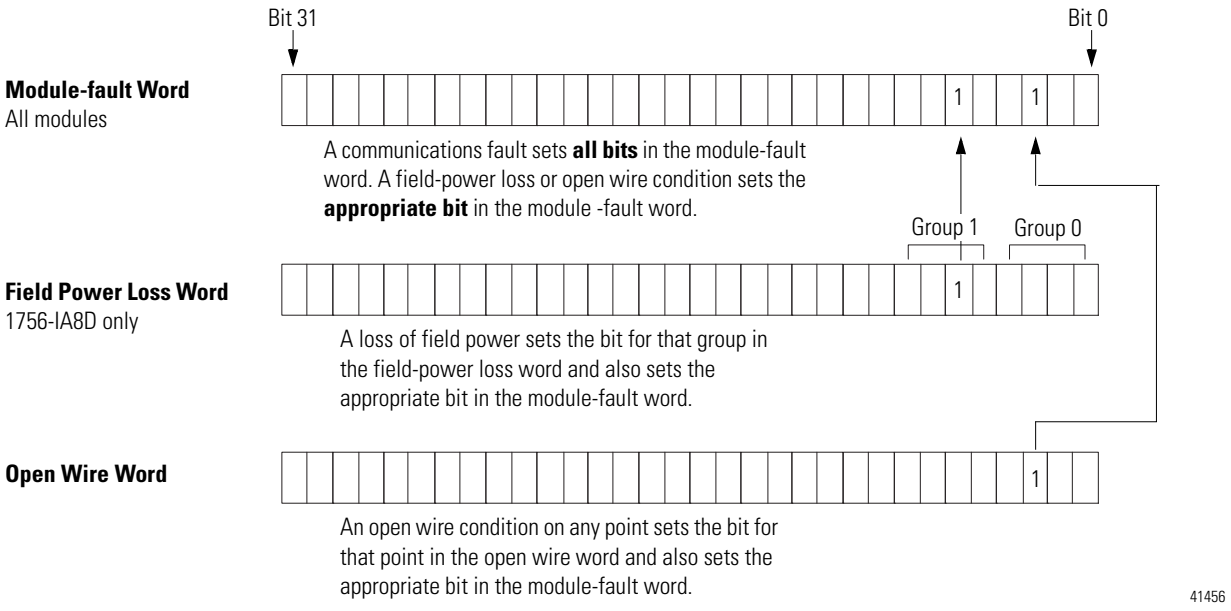
Tag	Description
Module-fault Word	This word provides fault summary reporting. It's tag name is Fault. This word is available on all digital input modules.
Field Power Loss Word	This word indicates loss of field power to a group on the module. It's tag name is FieldPwrLoss. This word is available on **1756-IA8D only**. See Field-power Loss Detection on Input Modules on page 81 for more information.
Open Wire Word	This word indicates the loss of a wire from a point on the module. It's tag name is OpenWire. See Open Wire Detection on page 80 for more information.

All words are 32-bit, although only the number of bits appropriate for each module's density are used. For example, the 1756-IA16I module has a module-fault word of 32 bits. But, because this is a 16-point module, only the first 16 bits (bits 0…15) are used in the module-fault word.

Fault bits in the field-power loss word and open wire word are logically entered into the module-fault word. In other words, depending on the module type, a bit set in the module-fault word can mean multiple things, as indicated in the table.

Condition	Bit set
Communications fault	All 32 bits are set to 1, regardless of the module's density.
Field-power loss	Only the bit affected is set to 1.
Open wire	

The following illustration provides an overview of the fault reporting process for digital input modules.


Bit 31
Bit 0
Module-fault Word
All modules
1
1
A communications fault sets all bits in the module-fault word. A field-power loss or open wire condition sets the appropriate bit in the module -fault word.
Group 1
Group 0
Field Power Loss Word
1756-IA8D only
1
A loss of field power sets the bit for that group in the field-power loss word and also sets the appropriate bit in the module-fault word.
Open Wire Word
1
An open wire condition on any point sets the bit for that point in the open wire word and also sets the appropriate bit in the module-fault word.
41456

Fault and Status Reporting Between Output Modules and Controllers

ControlLogix diagnostic digital output modules multicast fault and status data to any owner-listening controllers.

All output modules maintain a module-fault word, the highest level of fault reporting. Some modules also use additional words to indicate fault conditions.

The table lists the tags that can be examined in ladder logic to indicate when a fault has occurred for a diagnostic input module.

Tag	Description
Module-fault Word	This word provides fault summary reporting. It's tag name is Fault. This word is available on all digital input modules.
Fuse Blown Word	This word indicates a point or group fuse blown on the module. It's tag name is FuseBlown. See Electronic Fusing on page 85 for more information.
Field-power Loss Word	This word indicates loss of field power to a point on the module. It's tag name is FieldPwrLoss. This word is available on **1756-OA8D only**. See Field-power Loss Detection on Output Modules on page 92 for more information.
No Load Word	This word indicates a loss of a load from a point on the module. It's tag name is NoLoad. See No Load Detection on page 86 for more information.
Output Verify Word	This word indicates when an output is not performing as commanded by the owner-controller. It's tag name is OutputVerify. See Field-side Output Verification on page 87 for more information.

All words are 32-bit, although only the number of bits appropriate for each module's density are used. For example, the 1756-OB8 module has a module-fault word of 32 bits. But, because the module is an 8-point module, only the first 8 bits (bits 0…7) are used in the module-fault word.

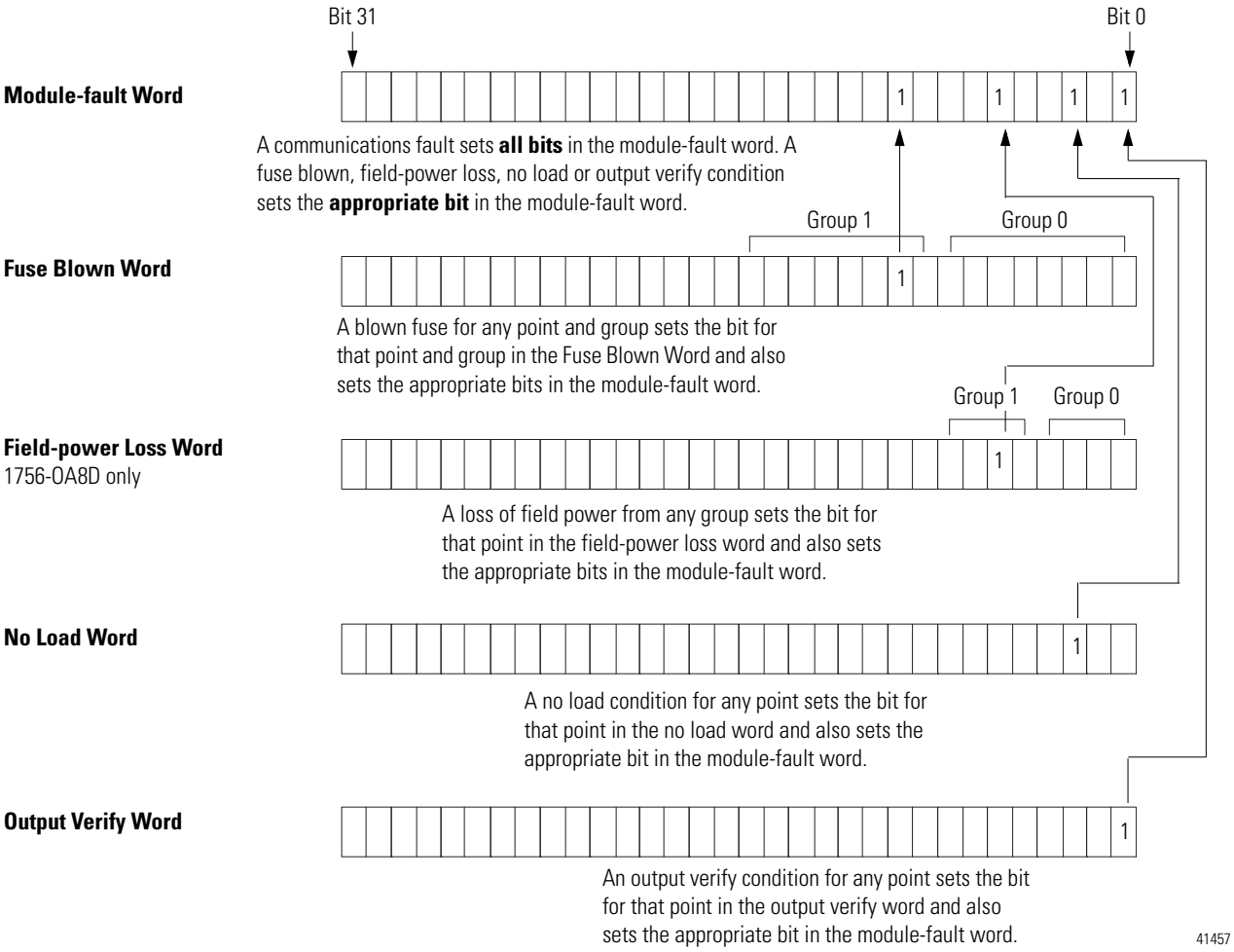
Fault bits in the fuse blown word, field-power loss word, no load word and output verify word are logically entered into the module-fault word.

In other words, depending on the module type, a bit set in the module-fault word can mean multiple things, as indicated in the table.

Bit Set Conditions

Condition	Bit set
Communications fault	All 32 bits are set to 1, regardless of the module's density.
Fuse blown	Only the bit affected is set to 1.
Field-power loss	
No load	
Output verify	

The following illustration provides an overview of the fault reporting process for digital output modules.


Bit 31
Bit 0
Module-fault Word
A communications fault sets all bits in the module-fault word. A fuse blown, field-power loss, no load or output verify condition sets the appropriate bit in the module-fault word.
Group 1
Group 0
Fuse Blown Word
A blown fuse for any point and group sets the bit for that point and group in the Fuse Blown Word and also sets the appropriate bits in the module-fault word.
Field-power Loss Word
1756-OA8D only
A loss of field power from any group sets the bit for that point in the field-power loss word and also sets the appropriate bits in the module-fault word.
No Load Word
A no load condition for any point sets the bit for that point in the no load word and also sets the appropriate bit in the module-fault word.
Output Verify Word
An output verify condition for any point sets the bit for that point in the output verify word and also sets the appropriate bit in the module-fault word.
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Install the ControlLogix I/O Module

Introduction

This chapter provides step-by-step instructions and illustrations for installing ControlLogix I/O modules. Topics include general guidelines for installing an I/O module, keying a removable terminal block (RTB), and how to use the correct RTB wiring type and housing depending on your system application.

Topic	Page
Install the I/O Module	97
Key the Removable Terminal Block	99
Connect the Wiring	100
Assemble the Removable Terminal Block and Housing	104
Install the Removable Terminal Block	107
Remove the Removable Terminal Block	108
Remove the Module from the Chassis	109

Install the I/O Module

You can install or remove a ControlLogix I/O module while chassis power is applied. Removal and Insertion Under Power (RIUP) provides the flexibility to maintain modules without having to stop production.

ATTENTION

Although the module is designed to support RIUP, when you remove or insert an RTB with field-side power applied, unintended machine motion or loss of process control can occur. Exercise extreme caution when using this feature.

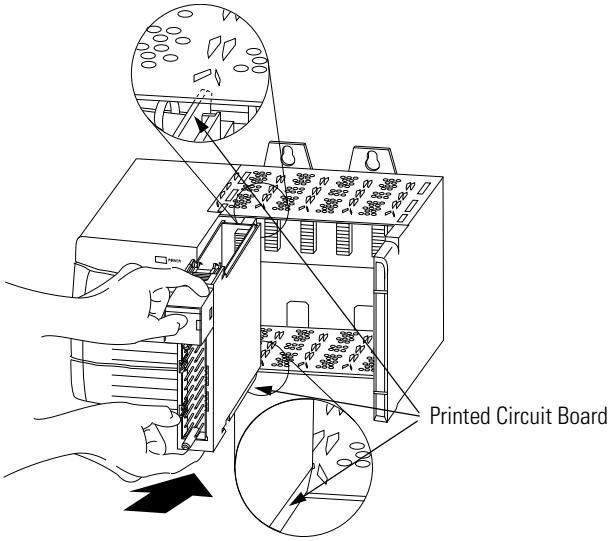
WARNING

When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installments.

Be sure the power is removed or the area is nonhazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

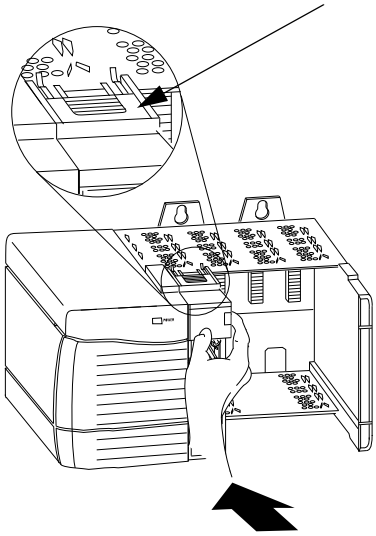
Follow these steps to insert the module into the chassis.

1. Align the circuit board with the top and bottom chassis guides.



20861-M

2. Slide the module into the chassis until the locking tabs 'click'.



20862-M

Installation of the module is now complete.

Key the Removable Terminal Block

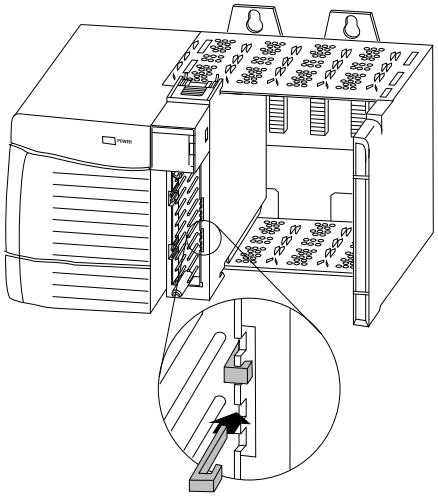
Key the removable terminal block (RTB) to prevent inadvertently connecting the wrong wiring in the RTB to your module. Wedge- and U-shaped bands are manually inserted into the RTB and module, respectively. This process hinders a wired RTB from being accidentally inserted into a module that does not match the positioning of the respective tabs.

Key positions on the module that correspond to unkeyed positions on the RTB. For example, if you place a U-shaped keying band in slot 4 on the module, do not insert a wedge-shaped tab in slot 4 on the RTB or your RTB will not mount on the module.

We recommend that you use a unique keying pattern for each slot in the chassis.

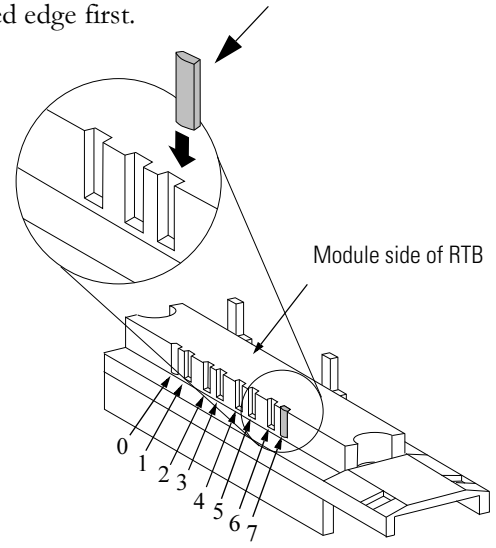
1. To key the module, insert the U-shaped band with the longer side near the terminals.

2. Push the band onto the module until it snaps into place.



20850-M

3. To key the RTB in positions that correspond to unkeyed module positions, insert the straight, wedge-shaped tab on the RTB with the rounded edge first.



4. Push the tab onto the RTB until it stops.

5. Repeat step 1…step 4 by using additional U-shaped and straight tabs until the module and RTB lock into each other properly.

Connect the Wiring

You can use an RTB or a Bulletin 1492 pre-wired Interface Module (IFM)[1] to connect wiring to your module. If you are using an RTB, follow the directions below to connect wires to the RTB. An IFM has been pre-wired before you received it.

To see a listing of the IFMs available for use with the ControlLogix analog I/O modules, see Appendix G.

This chapter explains the general guidelines for wiring your digital I/O modules, including grounding the cable and connecting the wires to each RTB type.

[1] The ControlLogix system has been agency certified using only the ControlLogix RTBs (1756-TBCH, 1756-TBNH, 1756-TBSH and 1756-TBS6H). Any application that requires agency certification of the ControlLogix system using other wiring termination methods may require application specific approval by the certifying agency

The following table shows each module catalog number and the corresponding page with the wiring diagram.

Cat. No.	Page	Cat. No.	Page
1756-IA8D	134	1756-OA16	188
1756-IA16	137	1756-OA16I	191
1756-IA16I	140	1756-OB8	194
1756-IA32	143	1756-OB8EI	197
1756-IB16	146	1756-OB8I	200
1756-IB16D	149	1756-OB16D	203
1756-IB16I	152	1756-OB16E	206
1756-IB32	155	1756-OB16I	209
1756-IC16	158	1756-OB16IS	212
1756-IG16	161	1756-OB32	215
1756-IH16I	164	1756-OC8	218
1756-IM16I	167	1756-OG16	221
1756-IN16	170	1756-OH81	224
1756-IV16	173	1756-ON8	227
1756-IV32	176	1756-OV16E	230
1756-OA8	179	1756-OV32E	233
1756-OA8D	182	1756-OW16I	236
1756-OA8E	185	1756-OX8I	239

RTB Types (each RTB comes with housing)

Wire the RTB with a 3.2 mm (1/8 in.) maximum flat-bladed screwdriver before installing it onto the module. These are the three types of RTBs:

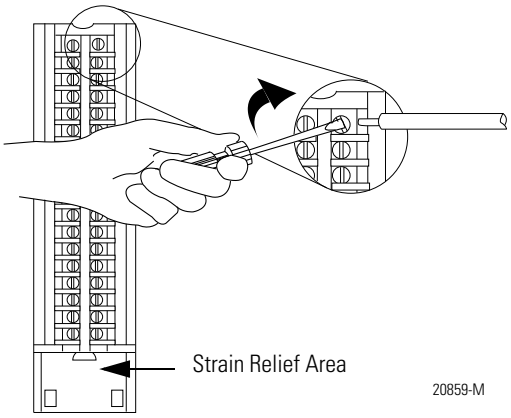
- Cage Clamp - catalog number 1756-TBCH
- NEMA Clamp - catalog number 1756-TBNH
- Spring Clamp - catalog number 1756-TBSH or TBS6H

Cage Clamp

Follow these steps to wire a cage clamp.

1. Strip 9.5 mm (3.8 in.) maximum length of wire.
2. Insert the wire into the open terminal on the side.

3. Turn the screw clockwise to close the terminal on the wire.

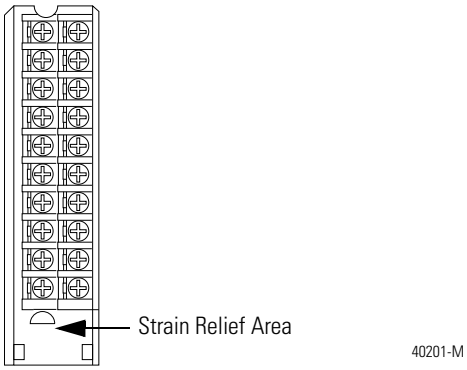


The open section at the bottom of the RTB is called the strain relief area. The wiring from the connections can be grouped with a plastic tie.

NEMA Clamp

Follow these steps to wire a NEMA clamp.

1. Strip 8 mm (5/16 in.) maximum length of wire.
2. Turn the terminal screw counterclockwise.
3. Insert the stripped end of the wire under the plate on the terminal.



4. Turn the terminal screw clockwise until the wire is secured.

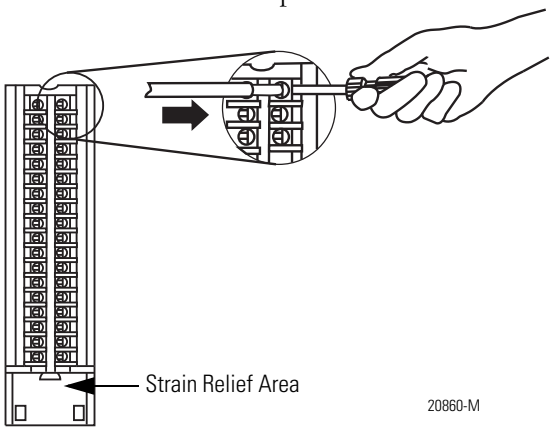
The open section at the bottom of the RTB is called the strain relief area. The wiring from the connections can be grouped with a plastic tie.

Spring Clamp

Follow these steps to wire a spring clamp.

1. Strip 11 mm (7/16 in.) maximum length of wire.

2. Insert the screwdriver into the outer hole of the RTB to depress the spring-loaded clamp.
3. Insert the wire into the open terminal and remove the screwdriver..



IMPORTANT Make sure the wire, and not the screwdriver, is inserted into the open terminal to prevent damage to the module.

The open section at the bottom of the RTB is called the strain relief area. The wiring from the connections can be grouped with a plastic tie.

RTB Wiring Recommendations

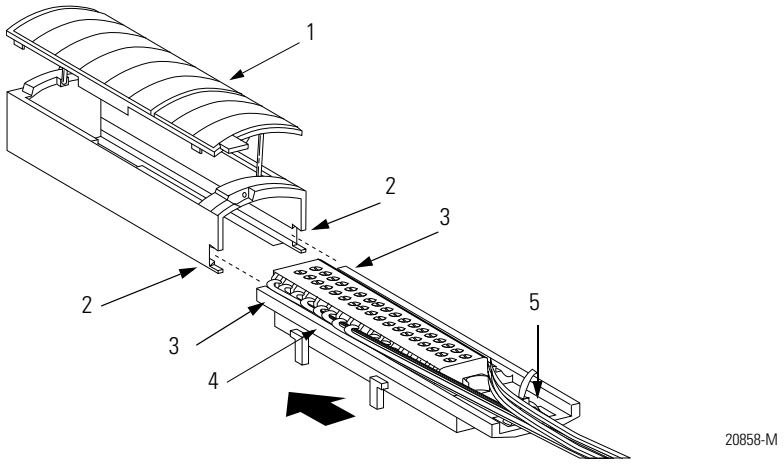
Consider the following guidelines when you are wiring your RTB.

- Begin wiring the RTB at the bottom terminals and move up.
- Use a tie to secure the wires in the strain relief area of the RTB.
- A jumper bar is shipped with certain I/O modules to assist in installation. For an example of when to use the jumper bar, see the 1756-IA16I wiring diagram.

  Extra jumper bars may be purchased by ordering catalog number 1756-JMPR
- Order and use an extended-depth housing (catalog number 1756-TBE) for applications that require heavy gauge wiring. For more information, see page 105.

Assemble the Removable Terminal Block and Housing

Removable housing covers the wired RTB to protect wiring connections when the RTB is seated on the module. Parts of the catalog number 1756-TBCH RTB (example below) are identified in the table.



Item	Description
1	Housing cover
2	Groove
3	Side edge of RTB
4	RTB
5	Strain relief area

Follow these steps to attach the RTB to the housing.

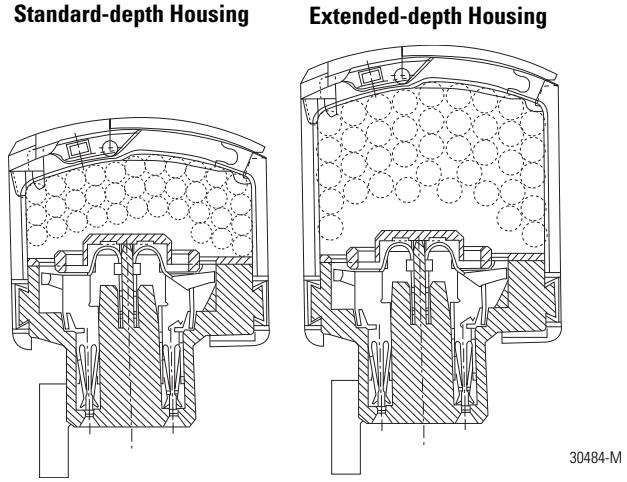
1. Align the grooves at the bottom of each side of the housing with the side edges of the RTB.
2. Slide the RTB into the housing until it snaps into place.

IMPORTANT If additional wire routing space is required for your application, use the extended-depth housing, catalog number1756-TBE.

Choose the Extended-depth Housing

There are two housing options you must consider when wiring your ControlLogix digital I/O module: standard-depth or extended-depth.

When you order an RTB for your I/O module, you receive a standard-depth housing. If your application uses heavy gauge wiring, you can order an extended-depth housing. The extended-depth housing does not come with an RTB..

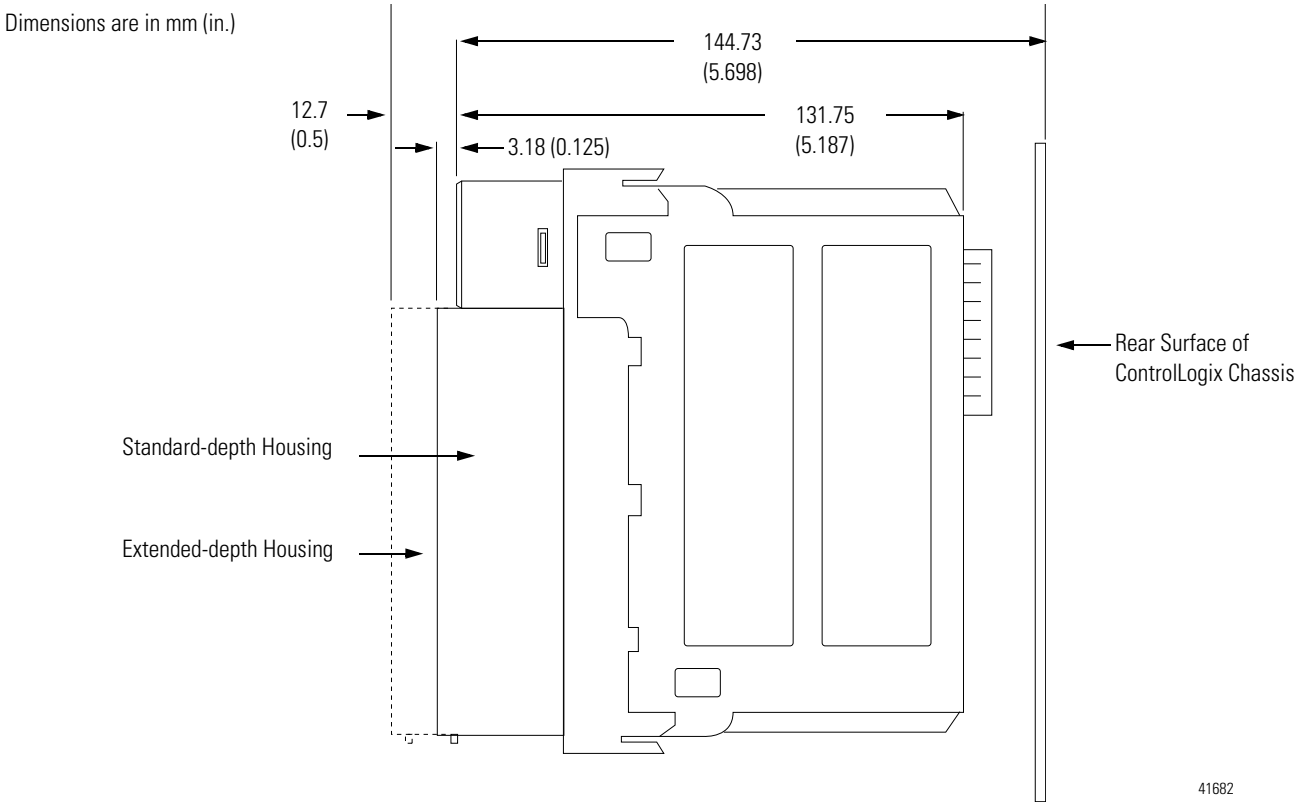


IMPORTANT The housings shown are used with a spring clamp RTB, but the capacity for each remains the same regardless of RTB type.

Cat. No.	RTB Type	Wire Capacity	Number of Wires
1756-TBNH	NEMA clamp	Standard-depth 336 mm^2 (0.52 $in.^2$)	36 - 18 AWG wires 23 - 14 AWG wires
1756-TBSH	Spring clamp (20-position)		
1756-TBCH	Cage clamp		
1756-TBS6H	Spring clamp (36-position)		
1756-TBE	Any RTB that uses heavy gauge wiring	Extended-depth 628 mm^2 (0.97 $in.^2$)	40 - 14 AWG wires

Cabinet Size Considerations with Extended-depth Housing

When you use an extended-depth housing (catalog number 1756-TBE), the I/O module depth is increased. The diagram shows the difference, in terms of depth, between an I/O module by using a standard-depth housing and one by using an extended-depth housing.



IMPORTANT The depth from the front of the module to the back of the chassis is as follows:

- Standard-depth housing = 147.91 mm (5.823 in.)
- Extended-depth housing = 157.43 mm (6.198 in.)

Install the Removable Terminal Block

This section shows how to install the RTB onto the module to connect the wiring.

ATTENTION

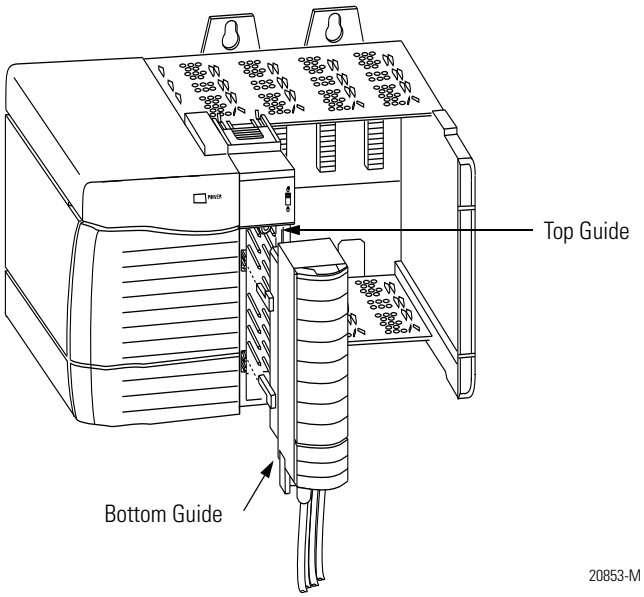
Shock hazard exists. If the RTB is installed onto the module while the field-side power is applied, the RTB will be electrically live. Do not touch the RTB's terminals. Failure to observe this caution may cause personal injury.

The RTB is designed to support Removal and Insertion Under Power (RIUP). However, when you remove or insert an RTB with field-side power applied, unintended machine motion or loss of process control can occur. Exercise extreme caution when using this feature. It is recommended that field-side power be removed before installing the RTB onto the module.

Before installing the RTB, make certain:

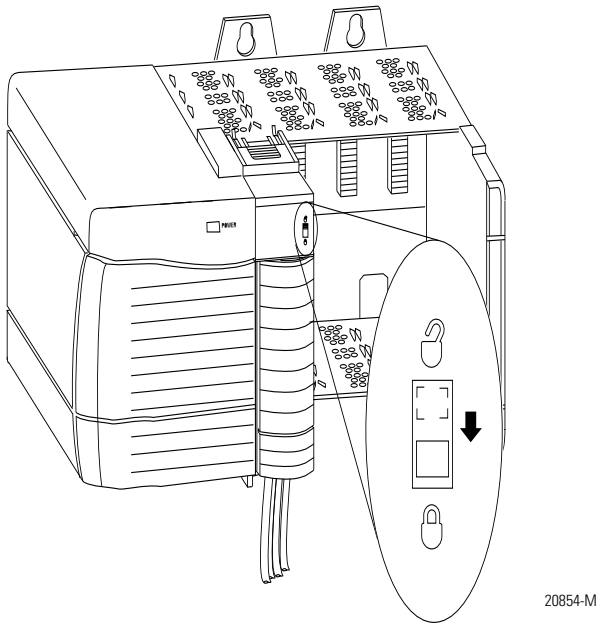
- field-side wiring of the RTB has been completed.
- RTB housing is snapped into place on the RTB.
- RTB housing door is closed.
- locking tab at the top of the module is unlocked.

1. Align the top, bottom and left side guides of the RTB with the guides on the module.



2. Press quickly and evenly to seat the RTB on the module until the latches snap into place.

3. Slide the locking tab down to lock the RTB onto the module.



Remove the Removable Terminal Block

If you need to remove the module from the chassis, you must first remove the RTB from the module.

ATTENTION

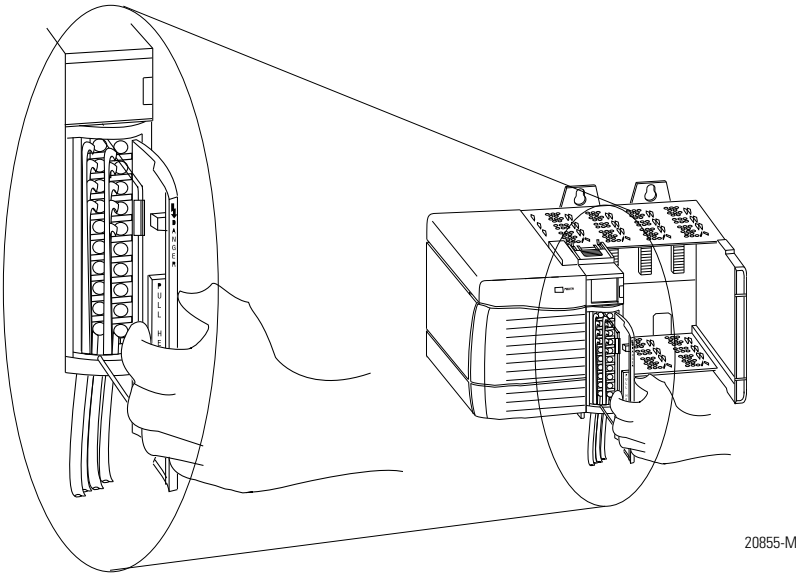
Shock hazard exists. If the RTB is removed from the module while the field-side power is applied, the module will be electrically live. Do not touch the RTB's terminals. Failure to observe this caution may cause personal injury.

The RTB is designed to support Removal and Insertion Under Power (RIUP). However, when you remove or insert an RTB with field-side power applied, unintended machine motion or loss of process control can occur. Exercise extreme caution when using this feature. It is recommended that field-side power be removed before removing the module.

1. Unlock the locking tab at the top of the module.
2. Open the RTB door by using the bottom tab.

3. Hold the spot marked PULL HERE and pull the RTB off the module.

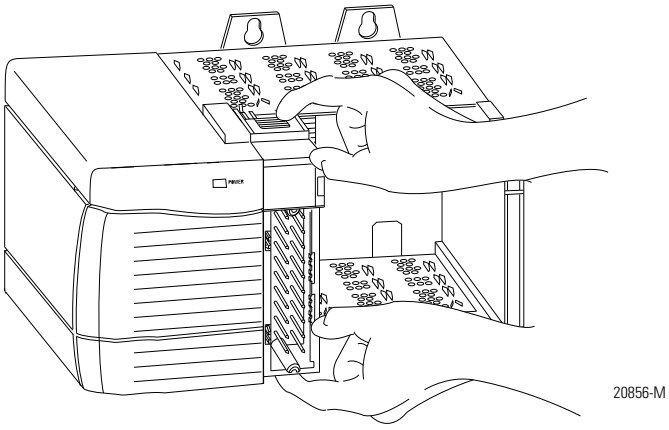
IMPORTANT Do not wrap your fingers around the entire door. A shock hazard exists.



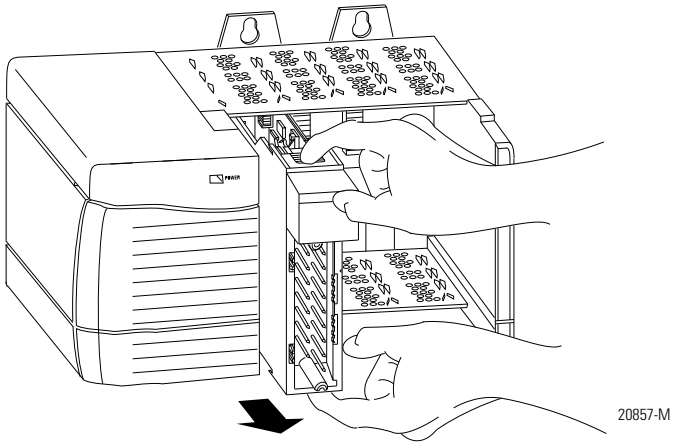
Remove the Module from the Chassis

Follow these steps to remove a module from its chassis.

1. Push in the top and bottom locking tabs.



2. Pull module out of the chassis.



Configure Your ControlLogix Digital I/O Modules

Introduction

You must configure your module upon installation. The module will not work until it has been configured.

In most cases, you will use RSLogix 5000 programming software to configure your digital I/O module. The programming software uses default configurations, such as RPI, filter times, and so forth, to get your I/O module to communicate with the owner-controller.

However, there are situations where you might want to modify the default settings. You can maintain custom settings on tabs from the Module Properties dialog box. This section provides step-by-step instructions for creating default and custom configurations.

Topic	Page
Create a New Module	114
Custom Settings (Modify Default Configuration)	120
Configure a Standard Input Module	124
Configure a Standard Output Module	125
Configure a Diagnostic Input Module	126
Configure a Diagnostic Output Module	126
Edit Configuration	127
Configure I/O Modules in a Remote Chassis	128
Input Online Service	129
Output Online Services	129
View and Change Module Tags	129

IMPORTANT

This section focuses on configuring I/O modules in a local chassis. To configure I/O modules in a remote chassis, you must follow all the detailed procedures with two additional steps. See page 128 for the additional remote chassis procedures.

RSLogix 5000 programming software must be installed on your computer to complete the procedures for both default and custom configurations.

For software installation instructions and to learn how to navigate the software package, see the RSLogix 5000 Getting Results Guide.

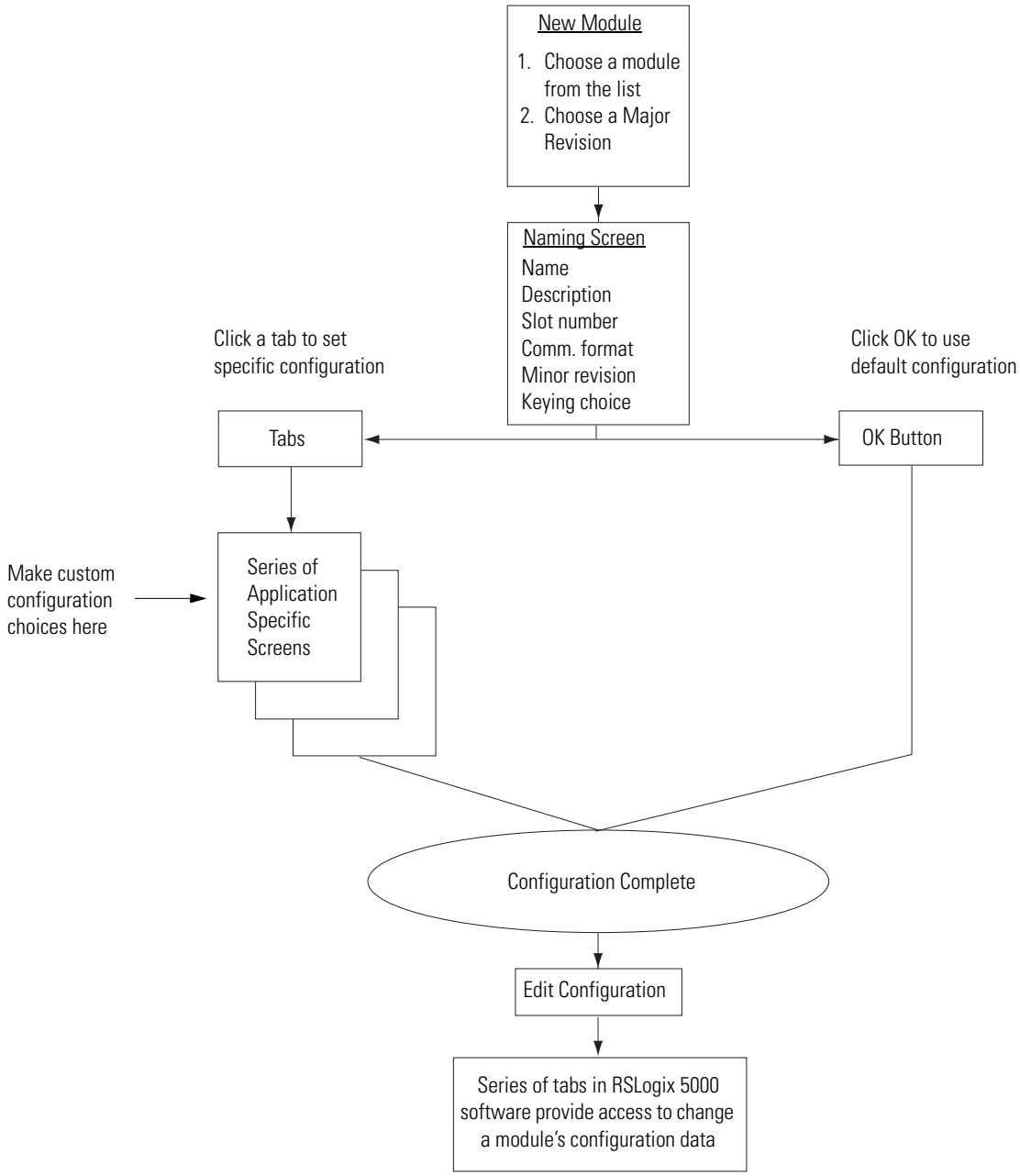
Configuration Process Overview

Follow these basic steps to configure a ControlLogix digital I/O module by using the RSLogix 5000 software.

1. Create a new module.
2. Accept the default configuration or change it to specific configuration (customized) for the module.
3. Edit a configuration for a module when changes are needed.

Each of these steps is explained in detail in the following pages. A chart that shows the full configuration profile is on page 113.

Full Configuration Profile Diagram

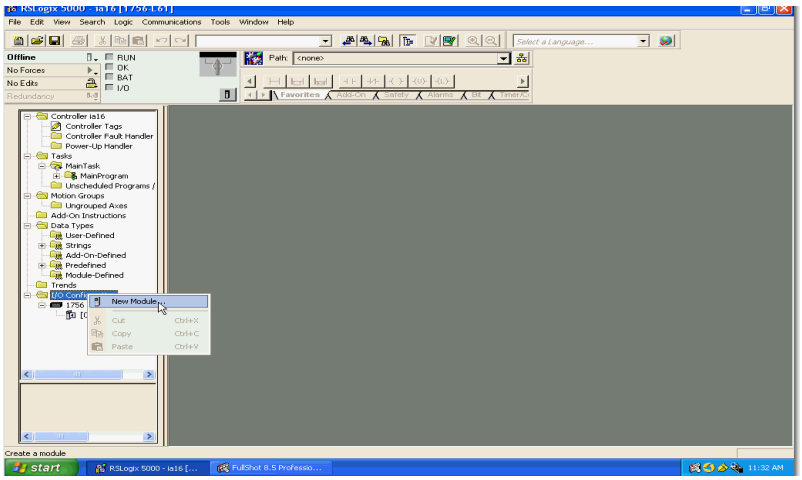


Create a New Module

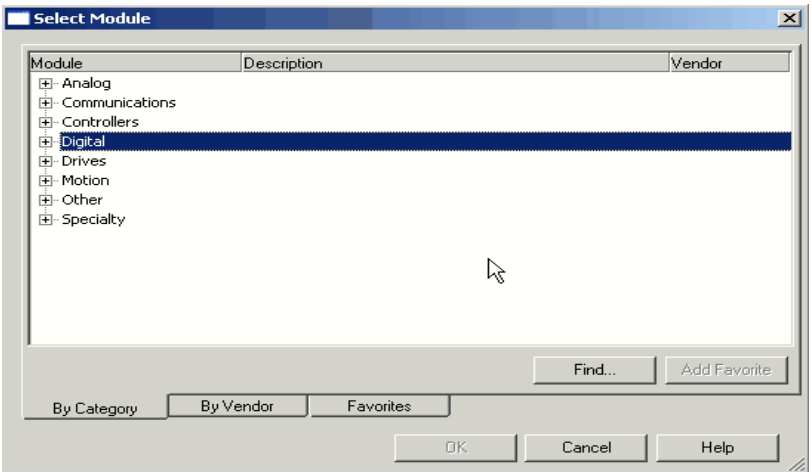
After starting the RSLogix 5000 programming software and creating a controller, you are ready to create a new module. You can use a default configuration or set up a custom, or specific, configuration for your application program.

IMPORTANT RSLogix 5000 software, version 15 and later, lets you add I/O modules online. When using any previous version, you must be offline when you create a new module.

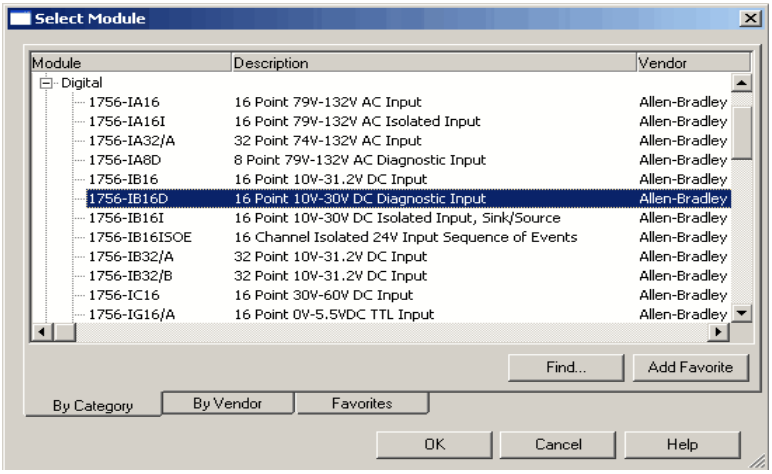
1. On the Controller Organizer, right-click I/O Configuration and choose New Module.



The Select Module dialog box appears.

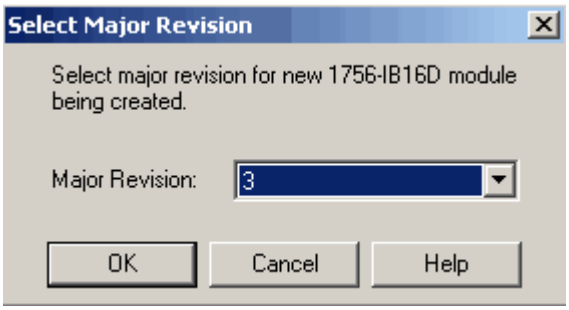


2. Click the '+' next to Digital for a list for this module group.


Select Module
Module
Description
Vendor
Digital
1756-IA16 16 Point 79V-132V AC Input Allen-Bradley
1756-IA16I 16 Point 79V-132V AC Isolated Input Allen-Bradley
1756-IA32/A 32 Point 74V-132V AC Input Allen-Bradley
1756-IA8D 8 Point 79V-132V AC Diagnostic Input Allen-Bradley
1756-IB16 16 Point 10V-31.2V DC Input Allen-Bradley
1756-IB16D 16 Point 10V-30V DC Diagnostic Input Allen-Bradley
1756-IB16I 16 Point 10V-30V DC Isolated Input, Sink/Source Allen-Bradley
1756-IB16ISOE 16 Channel Isolated 24V Input Sequence of Events Allen-Bradley
1756-IB32/A 32 Point 10V-31.2V DC Input Allen-Bradley
1756-IB32/B 32 Point 10V-31.2V DC Input Allen-Bradley
1756-IC16 16 Point 30V-60V DC Input Allen-Bradley
1756-IG16/A 16 Point 0V-5.5VDC TTL Input Allen-Bradley
Find...
Add Favorite
By Category
By Vendor
Favorites
OK
Cancel
Help

3. Select a module and click OK.

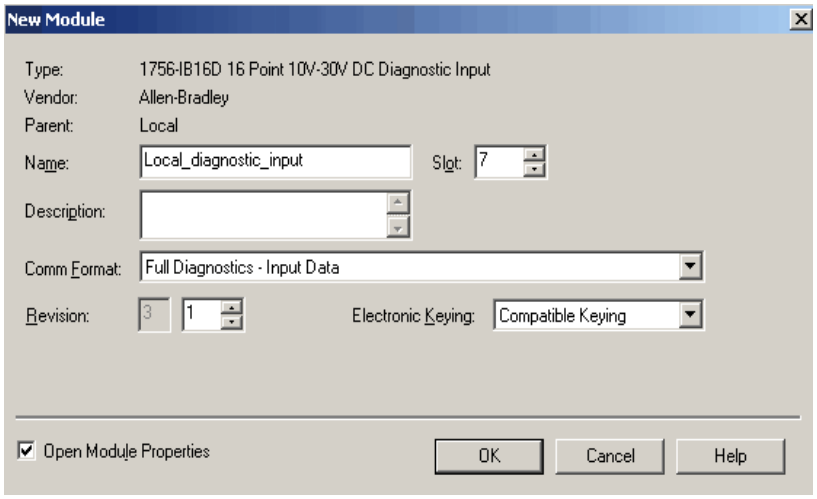
4. Click OK to accept the default major revision.



TIP

To find the revision number, open RSLinx software. Click the RSWho icon and choose the network. Open the module, and then right-click the module to choose Properties in the pull-down menu. The revision number is among the properties.

The New Module dialog box appears.



5. In the Name box, type a module name.
6. In the slot box, enter the module's slot number.
7. In the Description box, type an optional description for the module.
8. From the Comm Format pull-down menu, choose a communication format.

   See page 117 for a description of the communication format choices.

IMPORTANT Make sure you choose the correct communication format for your application because you cannot change the selection after the program is downloaded with the controller. You will have to reconfigure the module to change the communication format.

9. Choose an electronic keying method.

   See page 44 for details.

10. Do one of the following to either accept default configuration settings or edit configuration data.
    a. To accept the default configuration settings, make sure Open Module Properties is not checked and then click OK.
    b. To set up a custom configuration, make sure Open Module Properties is checked and then click OK.

       The New Module Properties dialog box appears with tabs for entry of additional configuration settings.

Communication Format

The communication format determines:

- what type of configuration options are made available.
- what type of data is transferred between the module and its owner-controller.
- what tags are generated when the configuration is complete.

Once a module is created, you cannot change the communication format unless you delete and recreate the module.

The communication format also defines the connection between the controller writing the configuration and the module itself. The number and type of choices varies depending on what module you are using and whether it is in a local or remote chassis.

TIP

When you choose a listen-only communication format, only the General and Connection tabs appear when you view a module's properties in RSLogix 5000 software.

Controllers that want to listen to a module but not own it use the listen-only communication format.

The table describes the communication formats used with input modules.

Input Module Communication Formats

Data Return	Communication Format	Module
Module returns only general fault and input data.	Input data	1756-IA16, -IA16I, -IA32, -IB16I, -IB16, -IB32, -IC16, -IG16, -IH16I, -IM16I, -IN16, -IV16, -IV32
Module returns input data with the value of the system clock (from its local chassis) when the input data changes.	CST timestamped input data	
The 1756-CNB module collects all digital input words in the remote chassis and sends them to the controller as a single rack image. This connection type limits the status and diagnostic information available.	Rack optimization	
These choices have the same definition as the similarly-named options above except that they are listen-only connections.	Listen only - input data	
	Listen-only -CST timestamped input data	
	Listen only - rack optimization	

Input Module Communication Formats

Data Return	Communication Format	Module
Module returns input data, the value of the system clock (from its local chassis) when the input data changes, and diagnostic data (diagnostic modules only).	Full diagnostic input data	1756-IA8D, -IB16D
This choice has the same definition as Full diagnostic input data except that it is a listen-only connection.	Listen only - full diagnostic input data	1756-IA8D, -IB16D

As with input modules, the number and type of choices varies depending on which output module you are using and whether it is in a local or remote chassis.

The table describes the communication formats used with output modules.

Output Module Communication Formats

Data Return	Communication Format	Module
The owner-controller sends the module only output data.	Output data	1756-OA8, -OA16I, -OB8, -OB8I, -OB16I, -OB16IS[1], -OB32, -OC8, -OG16, -OH8I, -ON8, -OW16I, -OX8I
The owner-controller sends the module output data and a CST timestamp value	Scheduled output data	
The owner-controller sends all digital output words to the remote chassis as a single rack image.	Rack optimization	
These choices have the same definition as those above except that they are listen-only connections.	Listen only - output data	
	Listen only - rack optimization	

Output Module Communication Formats

Data Return	Communication Format	Module
The owner-controller sends the module only output data. The module returns fuse blown status with the value of the system clock (from its local chassis) when the fuse is either blown or reset.	CST timestamped fuse data - output data	1756-OA16, -OA8E, -OB16E, -OB8EI, -OV16E, -OV32E
The owner-controller sends the module output data and a CST timestamp value. The module returns fuse blown status with the value of the system clock (from its local chassis) when the fuse is either blown or reset.	CST timestamped fuse data - scheduled output data	
This choice has the same definition as CST timestamped fuse data - output data except that it is a listen-only connection.	Listen only - CST timestamped fuse data - output data	
The owner-controller sends the module only output data. The module returns diagnostic data and a timestamp of diagnostics.	Full diagnostic - output data	1756-OA8D, -OB16D
The owner-controller sends the module output data and a CST timestamp value. The module returns diagnostic data and a timestamp of diagnostics.	Full diagnostics - scheduled output data	
This choice has the same definition as Full diagnostics - output data except that it is a listen-only connection.	Listen only - full diagnostics - output data	
The owner-controller sends the module output data and a CST timestamp value.	Scheduled output data per point	1756-OB16IS only

(1) The 1756-OB16IS module does not support the Rack optimization, Listen only - rack optimization and Scheduled output data communication formats.

Electronic Keying

When you configure a module, you can choose how specific the keying must be when a module is inserted into a slot in the chassis.

See page 44 for details.

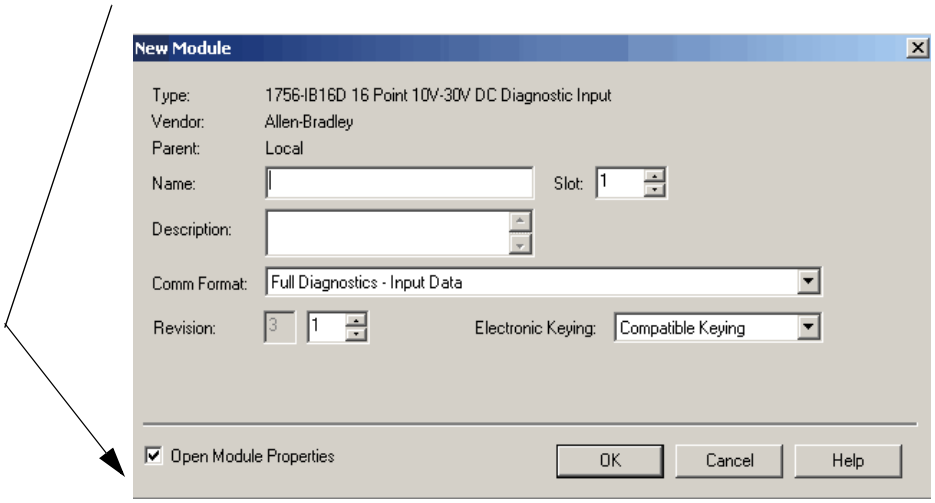
Custom Settings (Modify Default Configuration)

RSLogix 5000 programming software automatically creates module-defined data types and tags when a module is created. This section describes how to modify the default configuration.

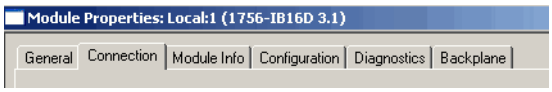
Data types symbolically name module configuration, input and output data. Tags let you provide each a unique name, such as where the user-defined data type and slot reside on the controller. This information is used to communicate data between the controller and module.

Follow these steps to modify a default configuration.

1. On the New Module dialog box, make sure Open Module Properties is checked and click OK.



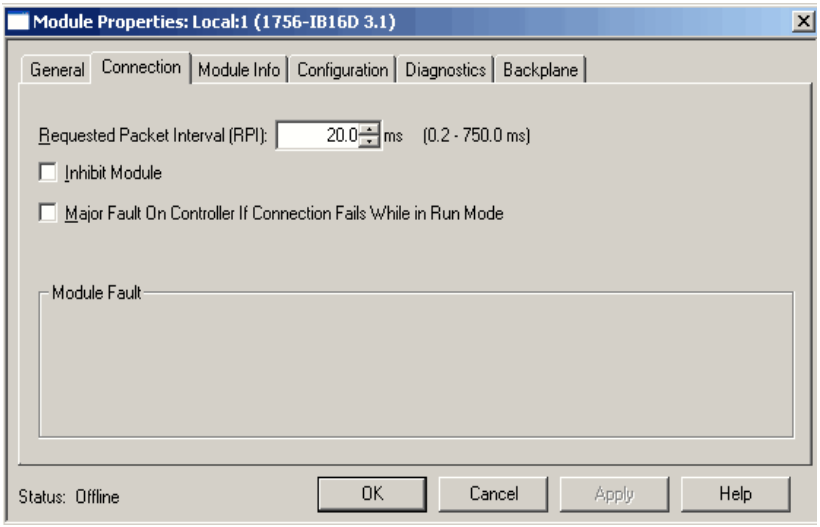
The Module Properties dialog box appears with tabs to access additional information. The Connection tab is the default.



TIP Tabs can be selected in any order. The following examples are for instructional purposes.

Connection Tab

The Connection tab on the Module Properties dialog box lets you enter a requested packet interval (RPI). The RPI provides a defined, maximum period of time when data is transferred to the owner-controller.



1. Choose from the options on the Connection tab.

Field Name	Description
Requested Packet Interval (RPI)	Enter an RPI value or use the default. See Requested Packet Interval (RPI) in Chapter 2 for more information.
Inhibit module	Check the box to prevent communication between the owner-controller and the module. This option allows for maintenance of the module without faults being reported to the controller. See Module Inhibiting in Chapter 3 for more information.
Major fault On Controller If Connection Fails While in Run Mode	Check the box to create a major fault if there is a connection failure with the module while in Run mode. For important information on this checkbox, see 'Configure a Major Fault to Occur' in the Logix5000 Controllers Information and Status Programming Manual, publication 1756-PM015.

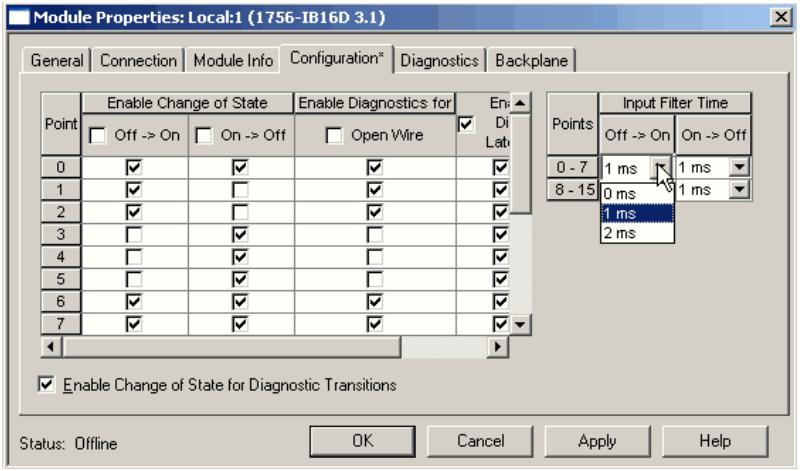
Field Name	Description
Module Fault	The fault box is empty if you are offline. The type of connection fault appears in the text box if a fault occurs when the module is online.

2. Do one of the following:

   - Click Apply to store a change but stay on the dialog box to choose another tab.
   - Click OK if you are finished making changes.

Configuration Tab

The Configuration tab lets you program information for a specific point on the module.



1. Choose from the options on the Configuration tab.

Field Name	Description
Enable Change of State Off->On On -> Off	Check each point on the module that you want to produce data whenever a change of state, such as Off/On - On/Off, is detected. Clear the box to disable the feature for each point. See Change of State (COS) in Chapter 2 for more information.

Field Name	Description
Enable Diagnostics for Open Wire	This option is available only for diagnostic modules. Check a point to enable open wire detection. Clear the box to disable the feature for each point. See Open Wire Detection in Chapter 4 for more information.
Enable diagnostic latching	This option is available only for diagnostic modules. Check a point to enable diagnostic latching. Clear the box to disable the feature for each point. See Diagnostic Latch of Information in Chapter 4 for more information.
Enable Change of State for Diagnostic Transitions	Check the box (lower portion of the screen) to transmit diagnostic status data with an updated timestamp when a change of state occurs.
Input filter time	Click the pull-down to choose how long a signal must be present before it is detected on a channel-wide basis. The first column enables points when power is turned Off to On, and the second column is for points when power is turned On to Off. See Software Configurable Filter Times in Chapter 4 for more information.

2. Do one of the following.
   a. Click Apply to store a changes but stay on the dialog box to choose another tab.
   b. Click OK if you are finished making changes.

Configure a Standard Input Module

The table lists the ControlLogix standard digital input modules and the features that can be configured.

Input Modules	Configured Feature	Description
1756-IA16	Change of state	See page 56.
1756-IA16I	Input filter times	See page 59.
1756-IA32		
1756-IB16		
1756-IB16I		
1756-IB32		
1756-IC16		
1756-IG16		
1756-IH16I		
1756-IM16I		
1756-IN16		
1756-IV16		
1756-IV32		

Configure a Standard Output Module

The table lists the ControlLogix standard digital output modules and the features that can be configured.

Input Modules	Configured Features	Description
1756-OA16 1756-OA16I 1756-OA8 1756-OA8E 1756-OB16E 1756-OB16I 1756-OB16IS 1756-OB32 1756-OB8 1756-OB8I 1756-OB8EI 1756-OC8 1756-OG16 1756-OH8I 1756-ON8 1756-OV32E 1756-OW16I 1756-OX8I	Output state in Program mode	In Program or Fault mode, a controller will not run the control program to determine the state of the outputs based on information received from the inputs. If there is a fault, you can choose whether the outputs will behave as if the controller were in Program mode or Fault mode. See page 82 for more information.
	Output state in Fault mode	
	Transition from Program state to Fault state	
1756-OA8E only	Field power loss detection	See page 92.
	Diagnostic latching	See page 74.

Configure a Diagnostic Input Module

The table lists the ControlLogix diagnostic digital input modules and the features that can be configured.

Input Modules	Configured Features	Description
1756-IA8D 1756-IA16D	Change of state	See page 78.
	Input filter times	See page 79.
	Open wire detection	See page 80.
	Field power loss detection	See page 81.
	Diagnostic latching	See page 74.
	Diagnostic change of state	See page 78.

For more information on how to reset Latched Diagnostics, see page 129.

Configure a Diagnostic Output Module

The table lists the ControlLogix diagnostic digital output modules and the features that can be configured.

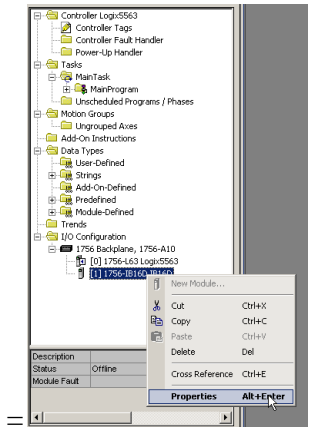
Input Modules	Configured Features	Description
1756-OA8D 1756-OB16D	Output state in Program mode	See page 82.
	Output state in Fault mode	
	Transition from Program state to Fault state	
	No load detection	See page 86.
	Diagnostic latching	See page 74.
	Output verify detection	See page 87.
1756-OA8D only	Field power loss detection	See page 92.

Edit Configuration

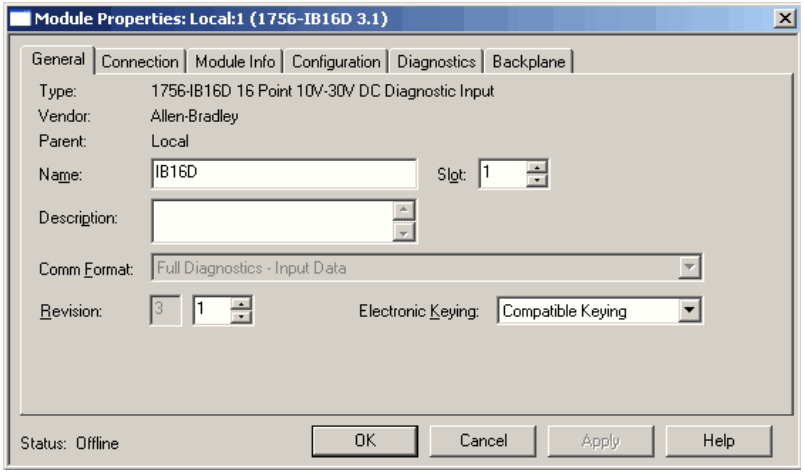
After you have set configuration for a module, you can review and change your choices in the RSLogix 5000 programming software. You can download the data to the controller while online. This is called dynamic reconfiguration.

Follow these steps to edit a module's configuration.

1. On the Controller Organizer, right-click an I/O module and choose Properties.



The Module Properties dialog box appears.



2. Click a tab that contains the fields that you want to edit.

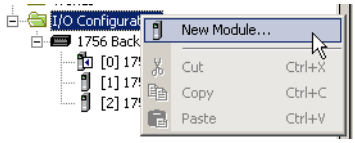
3. Make any changes, and then click OK.

Configure I/O Modules in a Remote Chassis

There are separate communication modules available for different networks to configure I/O modules in a remote chassis. ControlNet and EtherNet/IP communication modules must be configured in the local chassis and the remote chassis to handle network protocol. You can then add new I/O modules to the program via the communication module.

Follow these steps to configure a communication module for the local chassis. This module handles communication between the controller chassis and the remote chassis.

1. On the Controller Organizer, right-click I/O Configuration and choose New Module.



   The Select Module dialog box appears.

2. Click the '+' next to Communications for a list of communication modules.

3. Choose a communication module for the local chassis and click OK.

4. Click OK to accept the default major revision.

   The New Module dialog box appears.

5. Configure the communication module in the local chassis.

   For more information on the ControlLogix ControlNet module, see ControlNet Modules in Logix5000 Control Systems, publication CNET-UM001.

   For more information on the ControlLogix EtherNet/IP Bridge module, see EtherNet/IP Modules in Logix5000 Control Systems User Manual, publication ENET-UM001.

6. Repeat steps 1…6 to configure a communication module for the remote chassis.

7. Configure the communication module in the remote chassis.

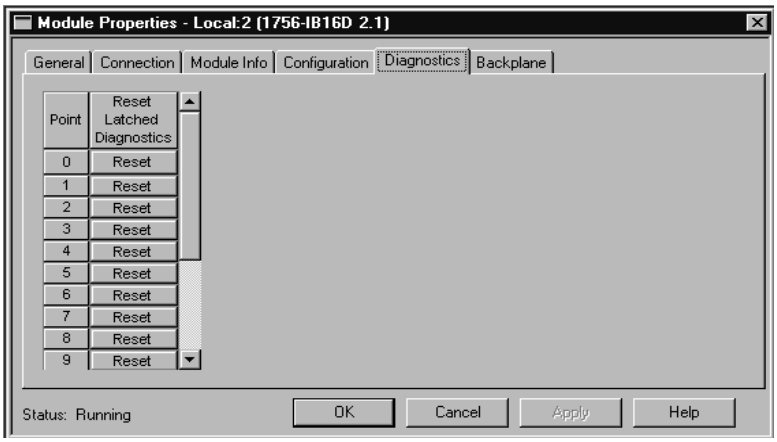
   Now you can configure the remote I/O modules by adding them to the remote communication module. Follow the same procedures as you do for configuring local I/O modules, starting on page 114.

Input Online Service

Diagnostic input modules have an additional page of diagnostic service. Reset Latched Diagnostics is not used when writing configuration; only accessed during online monitoring. This screen is accessed through the module's properties.

Follow these steps to perform a reset when a fault is latched in the set position.

1. On the Modules Properties screen, click the Diagnostics tab.



2. Click Reset for the appropriate point setting in the Reset Latched Diagnostics column.

3. Click OK.

Output Online Services

Diagnostic output modules have additional features.

- Electronic Fuse reset
- Reset Latched Diagnostics
- Pulse Test

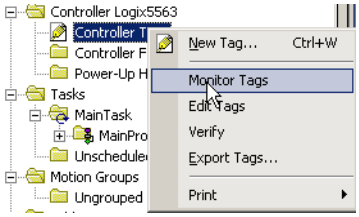
See Point-level Electronic Fusing and Pulse Test in Chapter 4 for procedures and sample screens.

View and Change Module Tags

When you create a module, a set of tags is created by the ControlLogix system that can be viewed in the Tag Editor of the RSLogix 5000 software. Each configured feature on your module has a distinct tag that can be used in the processor's ladder logic.

Follow these steps to access a module's tags.

1. At the top of the Controller Organizer, right-click Controller tags and choose Monitor Tags.



   The Controller Tags dialog box appears with data.

2. Click the slot number of the module that you want to view information.

   See Appendix B for details on viewing and changing a module's configuration tags.

Module-specific Information

Introduction

This chapter provides module-specific information for all ControlLogix digital modules. The table describes the different types of digital I/O modules.

Digital I/O Type	Description
Diagnostic	These modules provide diagnostic features to the point level. These modules have a **D** at the end of the catalog number.
Electronic fusing	These modules have internal electronic fusing to prevent too much current from flowing through the module. These modules have an **E** at the end of the catalog number.
Individually isolated	These modules have individually isolated inputs or outputs. These modules have an **I** at the end of the catalog number.

The following tables list where module-specific information are located in this section.

ControlLogix Input Modules	
Module	**Page**
1756-IA8D	134
1756-IA16	137
1756-IA16I	140
1756-IA32	143
1756-IB16	146
1756-IB16D	149
1756-IB16I	152
1756-IB32	155
1756-IC16	158
1756-IG16	161
1756-IH16I	164
1756-IM16I	167
1756-IN16	170
1756-IV16	173
1756-IV32	176

ControlLogix Output Modules	
Module	**Page**
1756-OA8	179
1756-OA8D	182
1756-OA8E	185
1756-OA16	188
1756-OA16I	191
1756-OB8	194
1756-OB8EI	197
1756-OB8I	200
1756-OB16D	203
1756-OB16E	206
1756-OB16I	209
1756-OB16IS	212
1756-OB32	215
1756-OC8	218
1756-OG16	221
1756-OH8I	224
1756-ON8	227
1756-OV16E	230
1756-OV32E	233
1756-OW16I	236
1756-OX8I	239

The 1756 digital I/O modules support these features.

Module Type	Features
1756 digital AC input modules	• Change of state: Software configurable • Timestamp of inputs: ±200 µs • Module keying: Electronic, software configurable • RTB keying: User-defined mechanical
1756 digital AC output modules	• Scheduled outputs: Synchronization within 16.7 seconds maximum, reference to the Coordinated System Time • Fault states per point: Hold last state, on or off (off is default) • States in Program mode per point: Hold last state, on or off (off is default) • Fusing: - 1756-OA8D, 1756-OA8E: Electronically fused per point - 1756-OA16: Mechanically fused/group, 3.15 A @ 250V AC slow blow, 1500 A interruption current, Littelfuse p/n H2153.15 - All other modules: Not protected. A fused IFM is recommended to protect outputs (see publication 1492-TD008) • Module keying: Electronic, software configurable • RTB keying: User-defined mechanical
1756 digital DC input modules	• Reverse polarity protection: All modules except 1756-IG16 module • Change of state: Software configurable • Timestamp of inputs: - ±100 µs for sequence of events modules(1) - ±200 µs for all other modules • Module keying: Electronic, software configurable • RTB Keying: User-defined mechanical
1756 digital DC output modules	• Scheduled outputs: Synchronization within 16.7 seconds maximum, reference to the Coordinated System Time • Fault states per point: Hold last state, on or off (off is default) • States in Program mode per point: Hold last state, on or off (off is default) • Fusing: - 1756-OB8EI, 1756-OB16D, 1756-OB16E, 1756-OV16E, 1756-OV32E: Electronically fused per point - All other modules. Not protected. A fused IFM is recommended to protect outputs (see publication 1492-TD008) • Module keying: Electronic, software configurable • RTB keying: User-defined mechanical

(1) For details, see the ControlLogix Sequence of Events Module Installation Instructions, publication 1756-IN592, and the ControlLogix Sequence of Events Module User Manual, publication 1756-UM528.

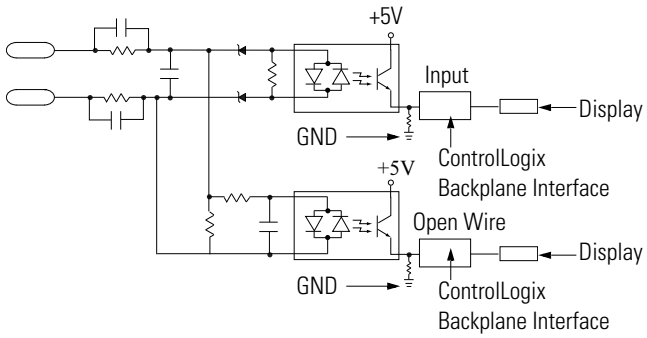
Module Type	Features
1756 digital contact modules	• Scheduled outputs: Synchronization within 16.7 seconds maximum, reference to the Coordinated System Time • Configurable fault states per point: Hold last state, on or off (off is default) • Configurable states in Program mode per point: Hold last state, on or off (off is default) • Fusing: Not protected. A fused IFM is recommended to protect outputs (See publication 1492-TD008) • Module keying: Electronic, software configurable • RTB keying: User-defined mechanical

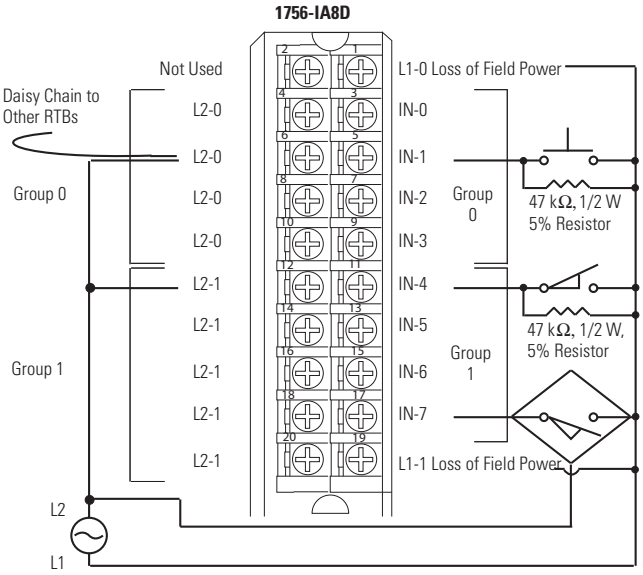
IMPORTANT For the latest I/O module specifications, see the 1756 ControlLogix I/O Modules Technical Specifications, publication 1756-TD002.

1756-IA8D

ControlLogix AC (79...132V) diagnostic input module

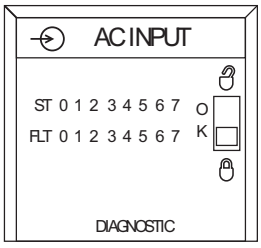
Simplified Schematic





Diagnostics - 1756-IA8D

Attribute	1756-IA8D
Open wire	Off-state leakage current 1.5 mA min
Loss of power	Transition range 46…85V AC
Timestamp of diagnostics	±1 ms



Technical Specifications - 1756-IA8D

Attribute	1756-IA8D
Inputs	8 diagnostic (4 points/group)
Voltage category	120V AC
Operating voltage range	79…132V AC, 47…63 Hz
Input voltage, nom	120V AC
Input delay time OFF to ON ON to OFF	 Hardware delay: 10 ms max + filter time User-selectable filter time: 1 or 2 ms Hardware delay: 8 ms max + filter time User-selectable filter time: 9 or 18 ms
Current draw @ 5.1V	100 mA
Current draw @ 24V	3 mA
Power dissipation, max	4.5 W @ 60 °C (140 °F)
Thermal dissipation	15.35 BTU/hr
Off-state voltage, max	20V

Technical Specifications - 1756-IA8D

Attribute	1756-IA8D
Off-state current, max	2.5 mA
On-state current, min	5 mA @ 74V AC
On-state current, max	16 mA @ 132V AC
Inrush current, max	250 mA
Input impedance, max	8.25 kΩ @ 132V AC, 60 Hz
Cyclic update time	200 µs...750 ms
Isolation voltage	125V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1200V AC for 2 s
Removable terminal block housing	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IA8D

Attribute	1756-IA8D
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges

Environmental Specifications - 1756-IA8D

Attribute	1756-IA8D
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-IA8D

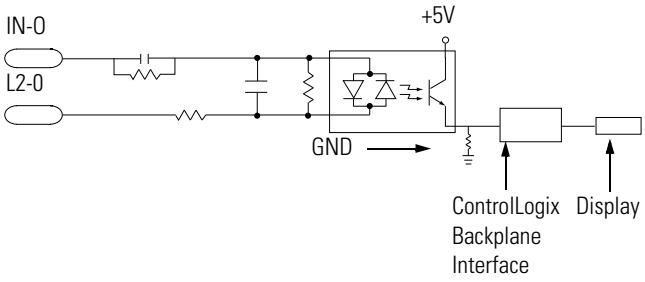
Certification[1]	1756-IA8D
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

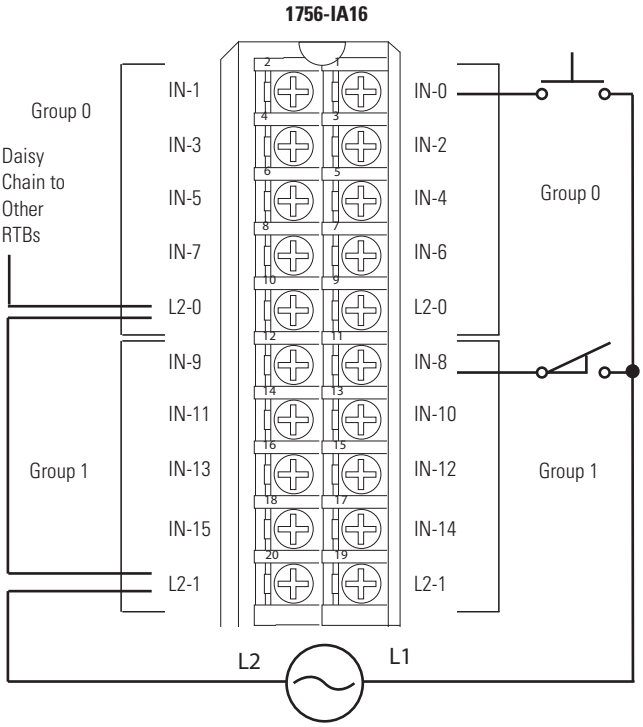
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

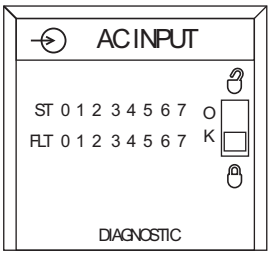
1756-IA16

ControlLogix AC (74...132V) input module

Simplified Schematic







Technical Specifications - 1756-IA16

Attribute	1756-IA16
Inputs	16 (8 points/group)
Voltage category	120V AC
Operating voltage range	74…132V AC, 47…63 Hz
Input voltage, nom	120V AC
Input delay time OFF to ON ON to OFF	 Hardware delay: 10 ms max + filter time User-selectable filter time: 1 or 2 ms Hardware delay: 8 ms max + filter time User-selectable filter time: 9 or 18 ms
Current draw @ 5.1V	105 mA
Current draw @ 24V	2 mA
Power dissipation, max	5.8 W @ 60 °C (140 °F)
Thermal dissipation	18.41 BTU/hr
Off-state voltage, max	20V
Off-state current, max	2.5 mA
On-state current, min	5 mA @ 74V AC
On-state current, max	13 mA @ 132V AC

Technical Specifications - 1756-IA16

Attribute	1756-IA16
Inrush current, max	250 mA peak (decaying to <37% in 22 ms, without activation)
Input impedance, max	10.15 kΩ @ 132V AC, 60 Hz
Cyclic update time	200 µs...750 ms
Isolation voltage	125V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1200V AC for 2 s
Removable terminal block housing	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IA16

Attribute	1756-IA16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6kV contact discharges 8kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports

Environmental Specifications - 1756-IA16

Attribute	1756-IA16
Surge transient immunity IEC 61000-4-5	±1kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-IA16

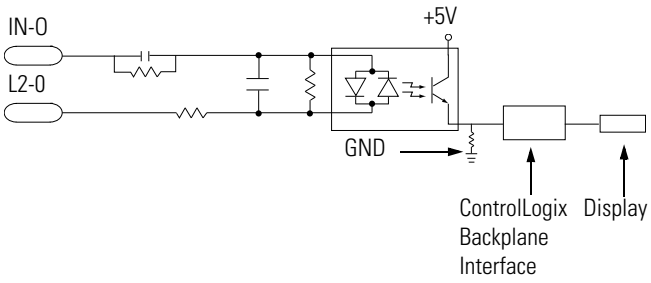
Certification[1]	1756-IA16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

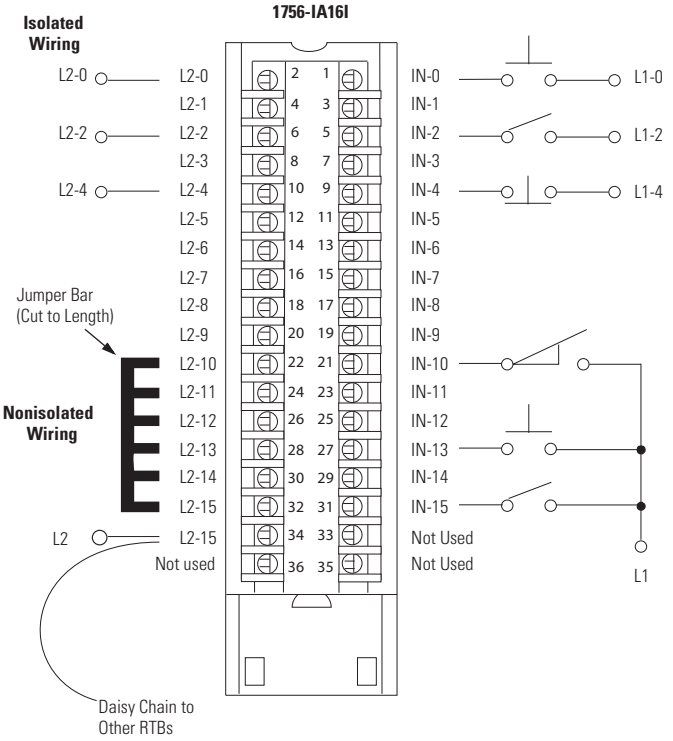
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-IA16I

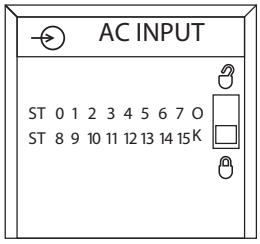
ControlLogix AC (79...132V) isolated input module

Simplified Schematic





Additional jumper bars may be purchased by using catalog number 1756-JMPR.



Technical Specifications - 1756-IA16I

Attribute	1756-IA16I
Inputs	16 individually isolated
Voltage category	120V AC
Operating voltage range	79…132V AC, 47…63 Hz
Input voltage, nom	120V AC
Input delay time OFF to ON ON to OFF	 Hardware delay: 10 ms max + filter time User-selectable filter time: 1 or 2 ms Hardware delay: 8 ms max + filter time User-selectable filter time: 9 or 18 ms
Current draw @ 5.1V	125 mA
Current draw @ 24V	3 mA
Power dissipation, max	4.9 W @ 60 °C (140 °F)
Thermal dissipation	16.71 BTU/hr
Off-state voltage, max	20V
Off-state current, max	2.5 mA
On-state current, min	5 mA @ 79V AC, 47…63 Hz
On-state current, max	15 mA @ 132V AC, 47…63 Hz

Technical Specifications - 1756-IA16I

Attribute	1756-IA16I
Inrush current, max	250 mA
Input impedance, max	8.8 kΩ@ 132V AC, 60 Hz
Cyclic update time	200 µs...750 ms
Isolation voltage	125V (continuous), basic insulation type, inputs-to-backplane, and input-to-input Routine tested @ 1200V AC for 2 s
Removable terminal block housing	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IA16I

Attribute	1756-IA16I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports

Environmental Specifications - 1756-IA16I

Attribute	1756-IA16I
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-IA16I

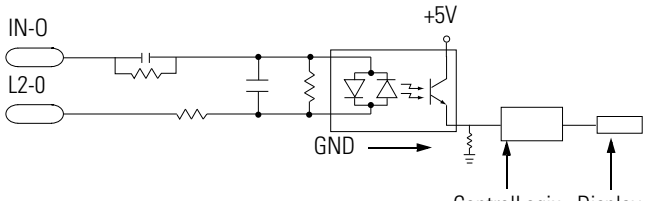
Certification[1]	1756-IA16I
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

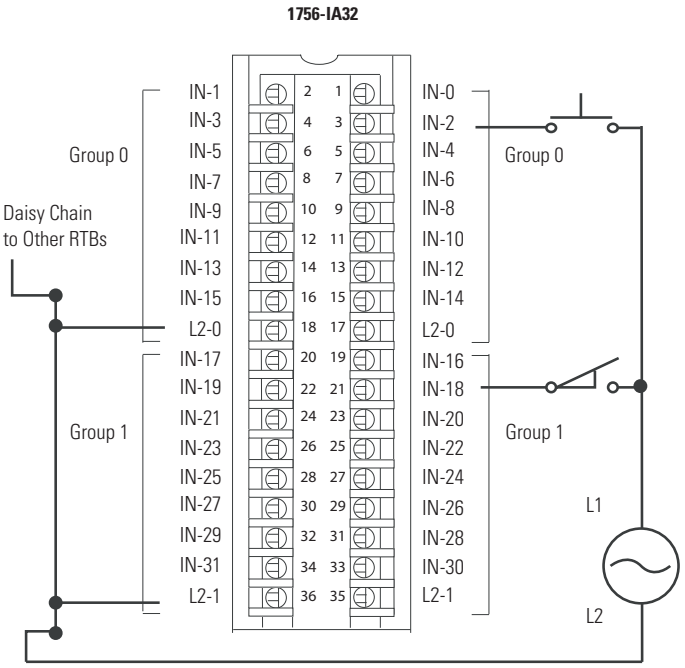
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

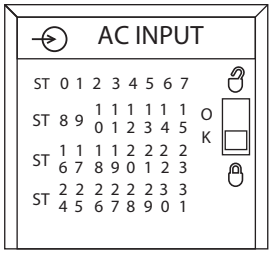
1756-IA32

ControlLogix AC (74...132V) input module

Simplified Schematic







Technical Specifications - 1756-IA32

Attribute	1756-IA32
Inputs	32 diagnostic (4 points/group)
Voltage category	120V AC
Operating voltage range	74…132V AC, 47…63 Hz
Input voltage, nom	120V AC
Input delay time OFF to ON	 Hardware delay: 1.5 ms nom/10 ms max + filter time User-selectable filter time: 1 or 2 ms
ON to OFF	Hardware delay: 1 ms nom/ 8 ms max + filter time User-selectable filter time: 9 or 18 ms
Current draw @ 5.1V	165 mA
Current draw @ 24V	2 mA
Power dissipation, max	6.1 W @ 60 °C (140 °F)
Thermal dissipation	20.8 BTU/hr
Off-state voltage, max	20V
Off-state current, max	2.5 mA
On-state current, min	5 mA @ 74V AC
On-state current, max	15 mA @ 132V AC
Inrush current, max	390 mA
Input impedance, max	14.0 kΩ@ 132V AC, 60 Hz

Technical Specifications - 1756-IA32

Attribute	1756-IA32
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane 125V (continuous), basic insulation type, input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IA32

Attribute	1756-IA32
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-IA32

Attribute	1756-IA32
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

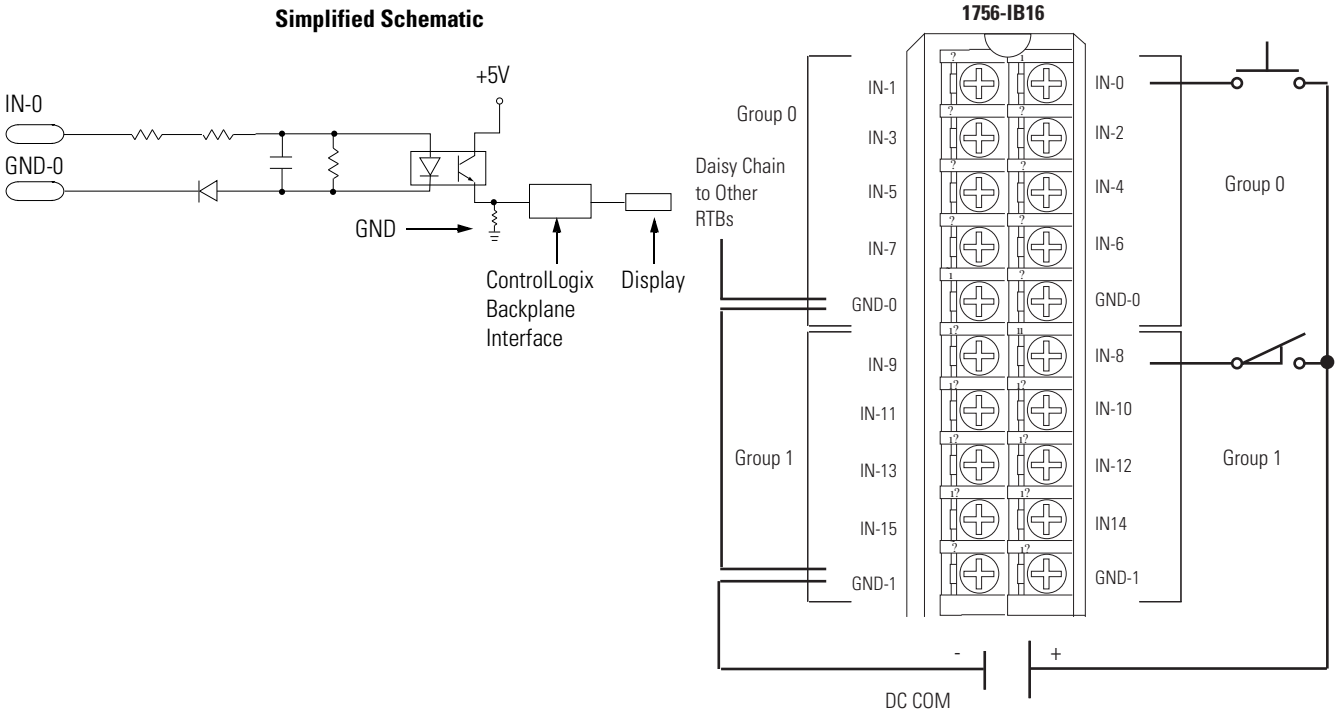
Certifications - 1756-IA32

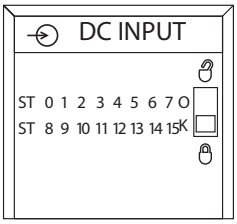
Certification[1]	1756-IA32
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-IB16

ControlLogix DC (10...31.2V) input module





Technical Specifications - 1756-IB16

Attribute	1756-IB16
Inputs	16 (8 points/group)
Voltage category	12/24V DC sink
Operating voltage range	10...31.2V DC
Input voltage, nom	24V DC
Input delay time OFF to ON	Hardware delay: 290 µs nom/1 ms max + filter time User-selectable filter time: 0, 1, or 2 ms
ON to OFF	Hardware delay: 700 µs nom/2 ms max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	100 mA
Current draw @ 24V	2 mA
Power dissipation, max	5.1 W @ 60 °C (140 °F)
Thermal dissipation	17.39 BTU/hr
Off-state voltage, max	5V
Off-state current, max	1.5 mA
On-state current, min	2 mA @ 10V DC
On-state current, max	10 mA @ 31.2V DC

Technical Specifications - 1756-IB16

Attribute	1756-IB16
Inrush current, max	250 mA peak (decaying to < 37% in 22 ms, without activation)
Input impedance, max	3.12 kΩ @ 31.2V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T3C
IEC temperature code	T3
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IB16

Attribute	1756-IB16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-IB16

Attribute	1756-IB16
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-IB16

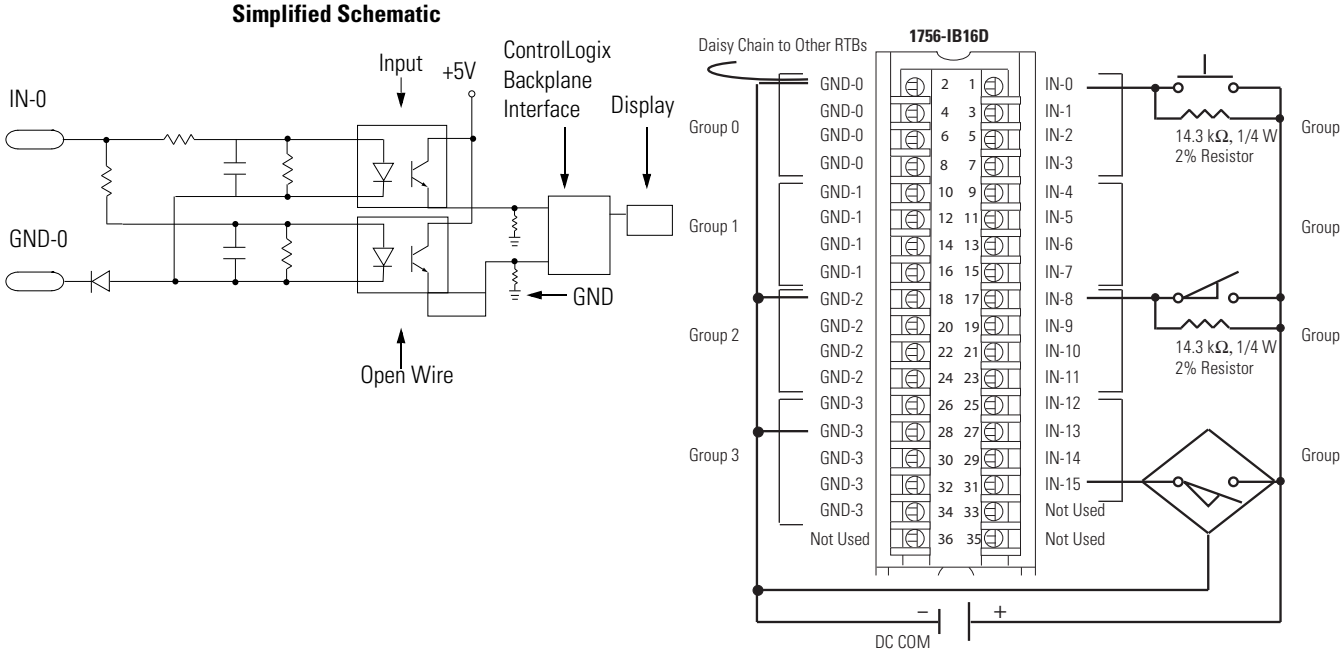
Certification[1]	1756-IB16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T3 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-IB16D

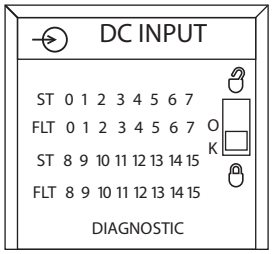
ControlLogix DC (10...30V) diagnostic input module

Simplified Schematic



Diagnostics - 1756-IB16D

Attribute	1756-IB16D
Open wire	Off-state leakage current 1.2 mA min
Timestamp of diagnostics	±1 ms



Technical Specifications - 1756-IB16D

Attribute	1756-IB16D
Inputs	16 diagnostic (4 points/group)
Voltage category	12/24V DC sink
Operating voltage range	10...30V DC
Input voltage, nom	24V DC
Input delay time OFF to ON ON to OFF	 Hardware delay: 340 µs nom/1 ms max + filter time User-selectable filter time: 0, 1, or 2 ms Hardware delay: 740 µs nom/4 ms max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	150 mA
Current draw @ 24V	3 mA
Power dissipation, max	5.8 W @ 60 °C (140 °F)
Thermal dissipation	19.78 BTU/hr

Technical Specifications - 1756-IB16D

Attribute	1756-IB16D
Off-state voltage, max	5V
Off-state current, max	1.5 mA
On-state current, min	2 mA @ 10V DC
On-state current, max	13 mA @ 30V DC
Inrush current, max	250 mA
Input impedance, max	2.31 kΩ@ 30V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T3C
IEC temperature code	T3
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IB16D

Attribute	1756-IB16D
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A

Environmental Specifications - 1756-IB16D

Attribute	1756-IB16D
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

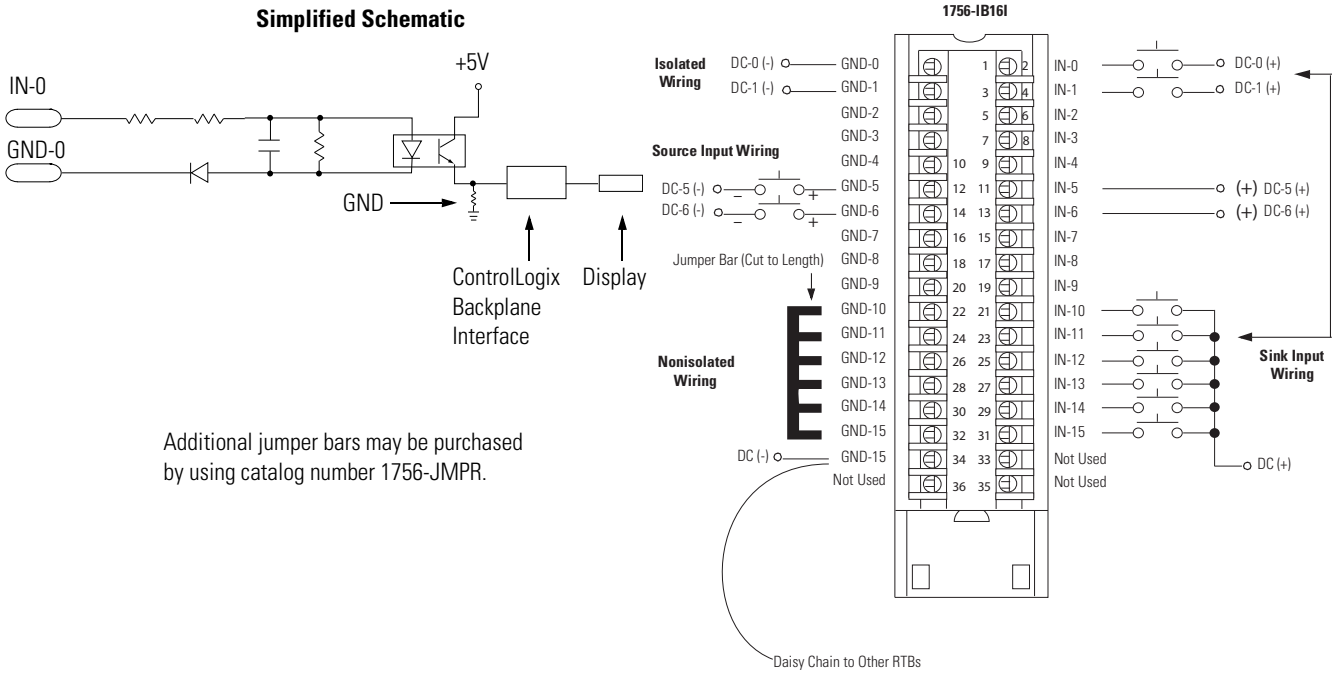
Certifications - 1756-IB16D

Certifications[1]	1756-IB16D
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T3 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

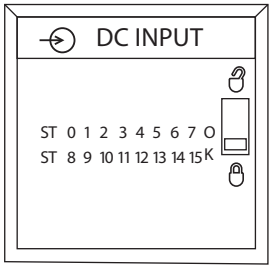
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-IB16I

ControlLogix DC (10...30V) isolated input module



Additional jumper bars may be purchased by using catalog number 1756-JMPR.



Technical Specifications 1756-IB16I

Attribute	1756-IB16I
Inputs	16 individually isolated
Voltage category	12/24V DC sink/source
Operating voltage range	10...30V DC
Input voltage, nom	24V DC
Input delay time OFF to ON ON to OFF	 Hardware delay: 1 ms max + filter time User-selectable filter time: 0, 1, or 2 ms Hardware delay: 4 ms max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	100 mA
Current draw @ 24V	3 mA
Power dissipation, max	5 W @ 60 °C (140 °F)
Thermal dissipation	17.05 BTU/hr
Off-state voltage, max	5V
Off-state current, max	1.5 mA
On-state current, min	2 mA @ 10 V DC
On-state current, max	10 mA @ 30V DC
Inrush current, max	250 mA peak (decaying to < 37% in 22 ms, without activation)

Technical Specifications 1756-IB16I

Attribute	1756-IB16I
Input impedance, max	3 kΩ@ 30V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input-to-input Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IB16I

Attribute	1756-IB16I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports

Environmental Specifications - 1756-IB16I

Attribute	1756-IB16I
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-IB16I

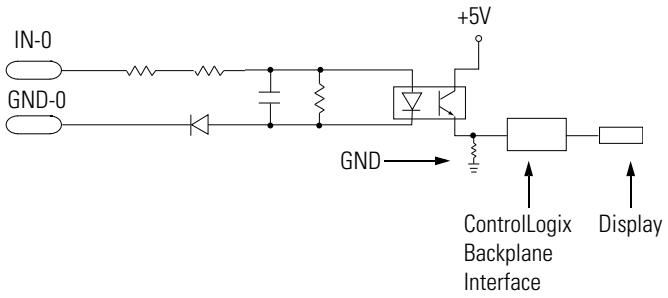
Certification[1]	1756-IB16I
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

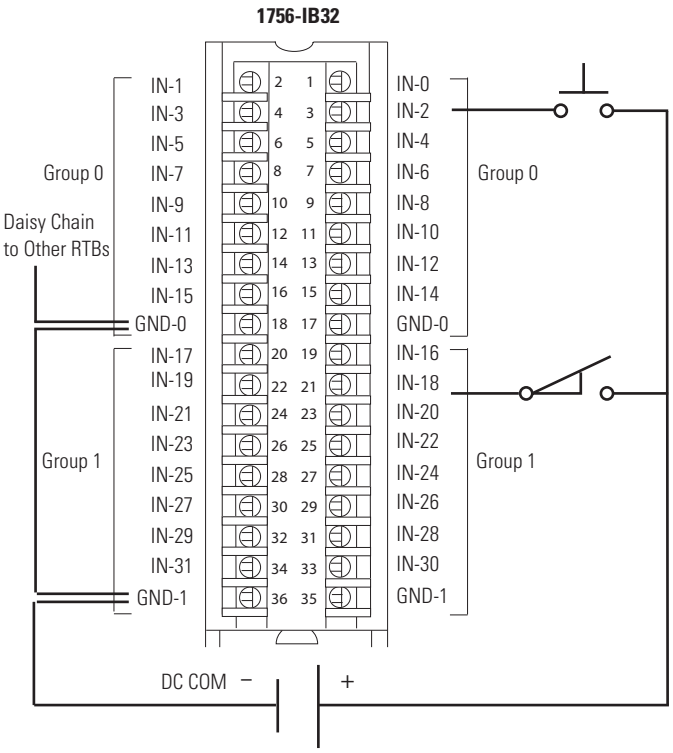
1756-IB32

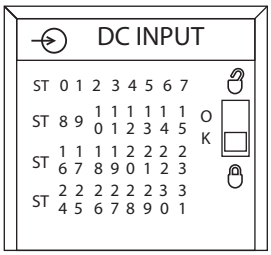
ControlLogix DC (10...31.2V) input module

Simplified Schematic



1756-IB32





Technical Specifications - 1756-IB32

Attribute	1756-IB32
Inputs	32 (16 points/group)
Voltage category	12/24V DC sink
Operating voltage range	10...31.2V DC
Input voltage, nom	24V DC
Input delay time OFF to ON ON to OFF	 Hardware delay:380 µs max + filter time User-selectable filter time: 0, 1, or 2 ms Hardware delay: 420 µs max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	120 mA
Current draw @ 24V	2 mA
Power dissipation, max	6.2 W @ 60 °C (140 °F)
Thermal dissipation	21.1 BTU/hr @ 60 °C (140 °F)
Off-state voltage, max	5V
Off-state current, max	1.5 mA
On-state current, min	2 mA
On-state current, max	5.5 mA
Inrush current, max	250 mA (decaying to < 37% in 22 ms, without activation)

Technical Specifications - 1756-IB32

Attribute	1756-IB32
Input impedance, max	5.67 kΩ@ 31.2V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), reinforced insulation type, inputs-to-backplane 250V (continuous), basic insulation type, input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1 - on signal ports(2)
North American temperature code	T4
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IB32

Attribute	1756-IB32
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-IB32

Attribute	1756-IB32
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

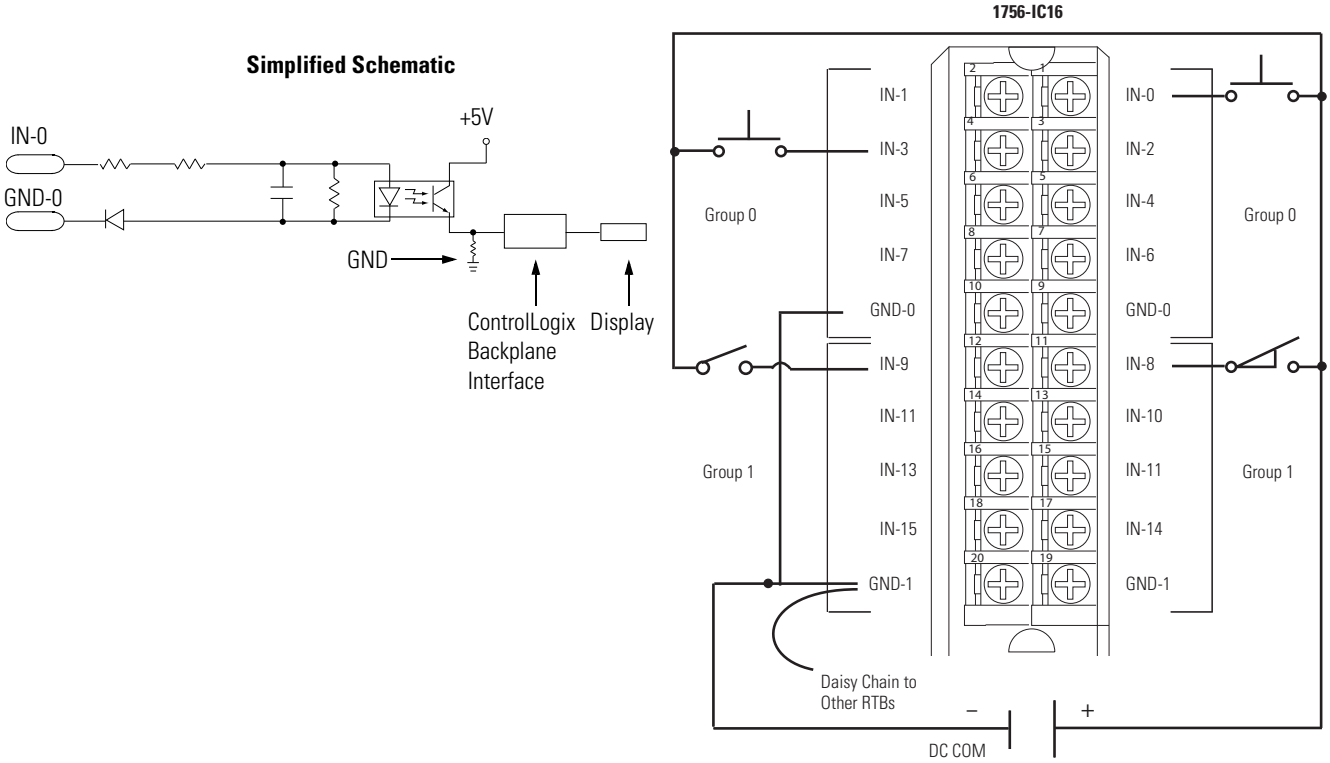
Certifications - 1756-IB32

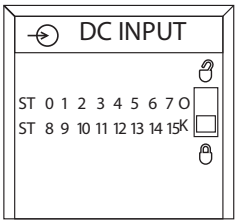
Certification[1]	1756-IB32
c-UL-us	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584. UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E194810.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-IC16

ControlLogix DC (30...60V) input module





Technical Specifications - 1756-IC16

Attribute	1756-IC16
Inputs	16 (8 points/group)
Voltage category	48V DC sink
Operating voltage range	30...55V DC @ 60 °C (140 °F) 30...60V DC @ 55 °C (131 °F)
Input voltage, nom	48V DC
Input delay time OFF to ON ON to OFF	 Hardware delay: 1 ms max + filter time User-selectable filter time: 0, 1, or 2 ms Hardware delay: 4 ms max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	100 mA
Current draw @ 24V	3 mA
Power dissipation, max	5.2 W @ 60 °C (140 °F)
Thermal dissipation	17.73 BTU/hr
Off-state voltage, max	10V
Off-state current, max	1.5 mA
On-state current, min	2 mA @ 30V DC

Technical Specifications - 1756-IC16

Attribute	1756-IC16
On-state current, max	7 mA @ 60V DC
Inrush current, max	250 mA
Input impedance, max	8.57 kΩ@ 60V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane 125V (continuous), basic insulation type, input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s, inputs-to-backplane Routine tested @ 924V AC for 2 s, input group-to-group
Removable terminal block housing	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IC16

Attribute	1756-IC16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges

Environmental Specifications - 1756-IC16

Attribute	1756-IC16
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-IC16

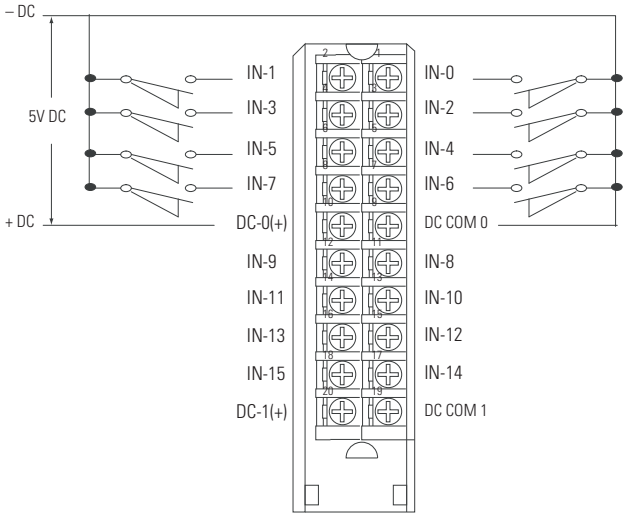
Certification[1]	1756-IC16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

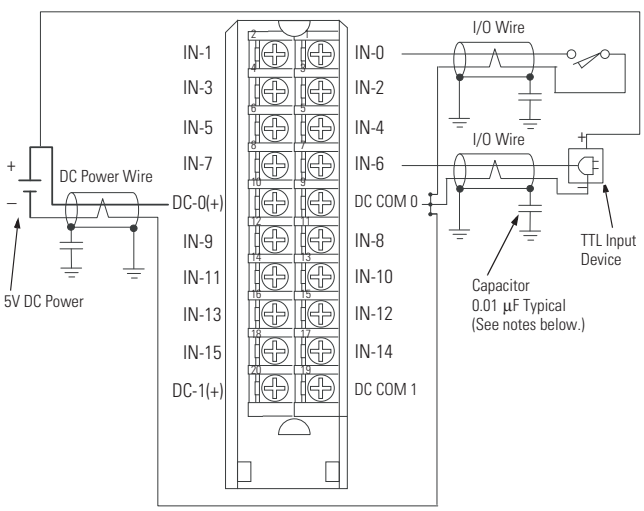
1756-IG16

ControlLogix TTL input module

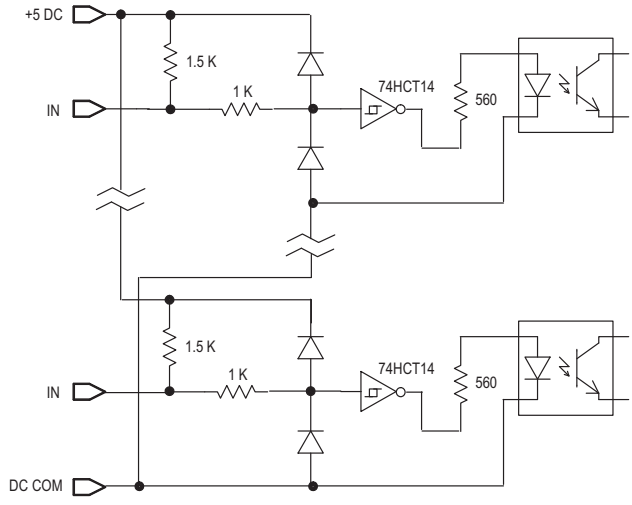
Standard Wiring



CE Compliant Wiring

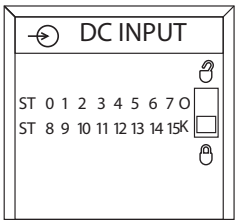


Simplified Schematic



Low to True Format - 1756-IG16

- -0.2…0.8V = Input guaranteed to be in on-state
- 0.8…2.0V = Input state not guaranteed
- 2.0…5.5V = Input guaranteed to be in off-state



Technical Specifications - 1756-IG16

Attribute	1756-IG16
Inputs	16 (8 points/group)
Voltage category	5V DC TTL source (Low=True)[1]
Operating voltage range	4.5...5.5V DC 50 mV P-P ripple max
Input delay time OFF to ON (5-to-0V DC transition) ON to OFF (0-to-5V DC transition)	 Hardware delay: 270 µs nom/450 µs max + filter time User-selectable filter time: 0, 1, or 2 ms Hardware delay: 390 µs nom/700 µs max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	110 mA
Current draw @ 24V	2 mA
Power dissipation, max	1.4 W @ 60 °C (140 °F)
Thermal dissipation	4.8 BTU/hr @ 60 °C (140 °F)
Off-state voltage, max	2V
Off-state current, max	4.1 mA
Input impedance, max	1.4 kΩ min 1.5 kΩ typical
Input current, nom	3.7 mA @ 5V DC
Input current, max	4.1 mA @ 5V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max[2]
Wire category	2[3]
North American temperature code	T5
IEC temperature code	T5
Enclosure type	None (open-style)

[1] TTL inputs are inverted (-0.2…0.8 = low voltage = True = On.) Use a NOT instruction in your program to convert to traditional True - High logic.

[2] Maximum wire size requires extended housing, catalog number 1756-TBE.

[3] Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IG16

Attribute	1756-IG16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

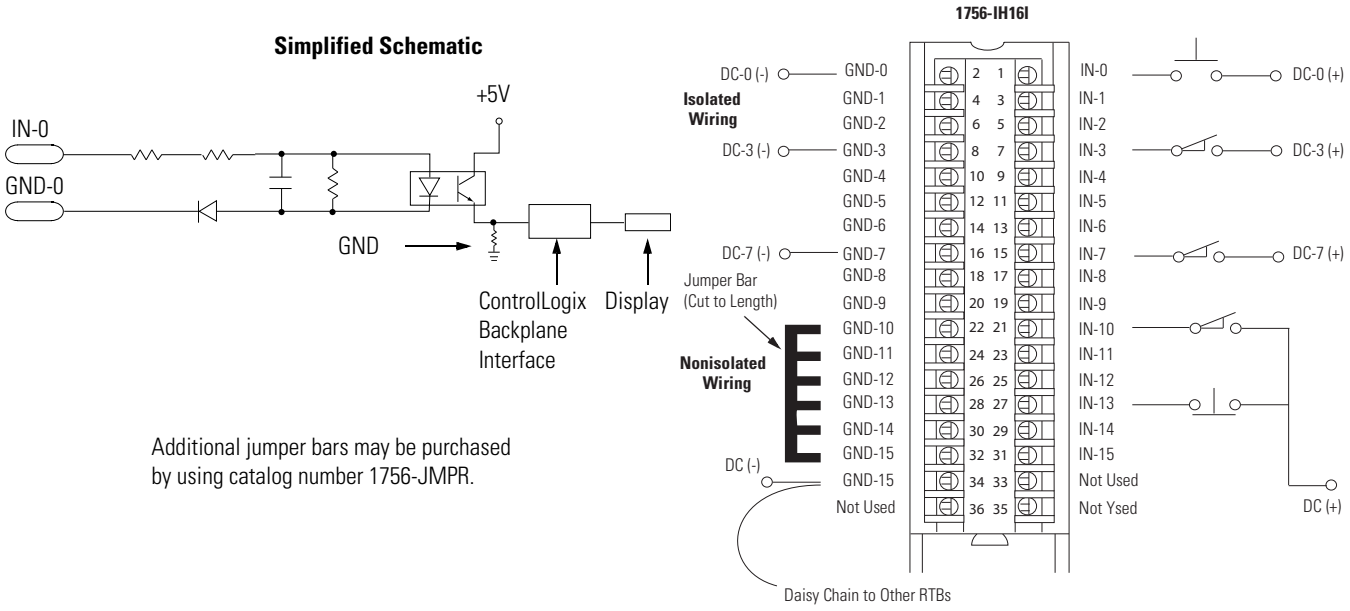
Certifications - 1756-IG16

Certification[1]	1756-IG16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T5 X

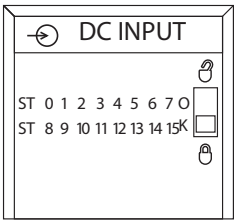
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-IH16I

ControlLogix DC (90...146V) isolated input module



Additional jumper bars may be purchased by using catalog number 1756-JMPR.



Technical Specifications - 1756-IH16I

Attribute	1756-IH16I
Inputs	16 individually isolated
Voltage category	125V DC sink/source
Operating voltage range	90...146V DC(1)
Input voltage, nom	125V DC
Input delay time OFF to ON ON to OFF	 Hardware delay: 2 ms max + filter time User-selectable filter time: 0, 1, or 2 ms Hardware delay: 6 ms max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	125 mA
Current draw @ 24V	3 mA
Power dissipation, max	5 W @ 60 °C (140 °F)
Thermal dissipation	17.05 BTU/hr
Off-state voltage, max	20V DC
Off-state current, max	0.8 mA
On-state current, min	1 mA @ 90V DC
On-state current, max	3 mA @ 146V DC
On-state voltage Derated as follows	90…146V DC 90…146V DC @ 50 °C (122 °F), 12 Channels ON 90…132V DC @ 55 °C (131 °F), 14 Channels ON 90…125V DC @ 60 °C (140 °F), 16 Channels ON 90…146V DC @ 30 °C (86 °F), 16 Channels ON

Technical Specifications - 1756-IH16I

Attribute	1756-IH16I
Inrush current, max	250 mA
Input impedance, max	48.67 kΩ@ 146V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input-to-input Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(2)
Wire category	1(3)
North American temperature code	T4
Enclosure type	None (open-style)

(1) 90...146V DC @ 50 °C (122 °F),12 channels on
90...132V DC @ 55 °C (131 °F), 14 channels on
90...125V DC @ 60 °C (140 °F), 16 channels on
90...146V DC @ 30 °C (86 °F), 16 channels on.

(2) Maximum wire size requires extended housing, catalog number 1756-TBE.

(3) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IH16I

Attribute	1756-IH16I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges

Environmental Specifications - 1756-IH16I

Attribute	1756-IH16I
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-IH16I

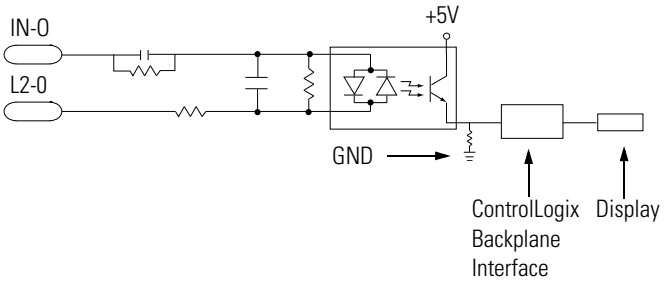
Certification[1]	1756-IH16I
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

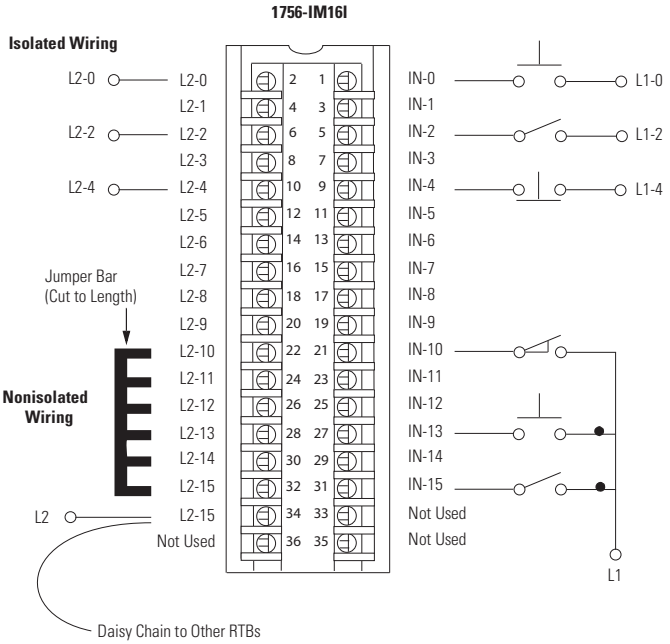
1756-IM16I

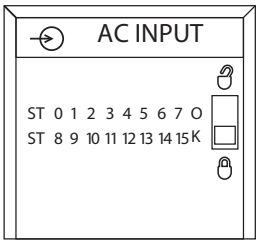
ControlLogix AC (159...265V) input module

Simplified Schematic



Additional jumper bars may be purchased by using catalog number 1756-JMPR.





Technical Specifications - 1756-IM16I

Attribute	1756-IM16I
Inputs	16 individually isolated
Voltage category	240V AC
Operating voltage range	159…265V AC, 47…63 Hz(1)
Input voltage, nom	240V AC
Input delay time OFF to ON ON to OFF	 Hardware delay: 10 ms max + filter time User-selectable filter time: 1 or 2 ms Hardware delay: 8 ms max + filter time User-selectable filter time: 9 or 18 ms
Current draw @ 5.1V	100 mA
Current draw @ 24V	3 mA
Power dissipation, max	5.8 W @ 60 °C (140 °F)
Thermal dissipation	19.78 BTU/hr
Off-state voltage, max	40V
Off-state current, max	2.5 mA
On-state current, min	5 mA @ 159V AC, 60 Hz
On-state current, max	13 mA @ 265V AC, 60 Hz

Technical Specifications - 1756-IM16I

Attribute	1756-IM16I
On-state voltage	159…265V AC, 47…63 Hz @ 30 °C (86 °F), all channels ON 159…265V AC, 47…63 Hz @ 40 °C (104 °F), 8 points ON 159…253V AC, 47…63 Hz @ 45 °C (113 °F), all channels ON 159…242V AC, 47…63 Hz @ 60 °C (140 °F), all channels ON
Inrush current, max	250 mA
Input impedance, max	20.38 kΩ@ 265V AC, 60 Hz
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input-to-input Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(2)
Wire category	1(3)
North American temperature code	T4
Enclosure type	None (open-style)

(1) 159…265V AC, 47…63 Hz @ 30 °C (86 °F), all channels on
159…265V AC, 47…63 Hz @ 40 °C (104 °F), 8 points on
159…253V AC, 47…63 Hz @ 45 °C (113 °F), all channels on
159…242V AC, 47…63 Hz @ 60 °C (140 °F), all channels on.

(2) Maximum wire size requires extended housing, catalog number 1756-TBE.

(3) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IM16I

Attribute	1756-IM16I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A

Environmental Specifications - 1756-IM16I

Attribute	1756-IM16I
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-IM16I

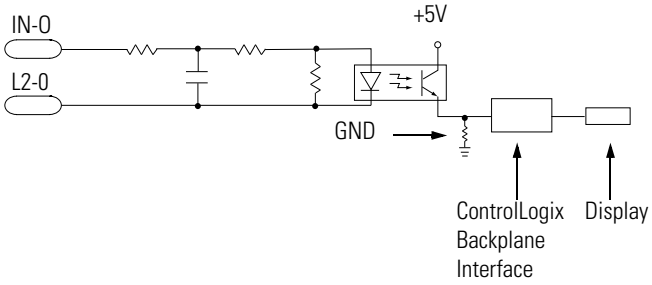
Certification[1]	1756-IM16I
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

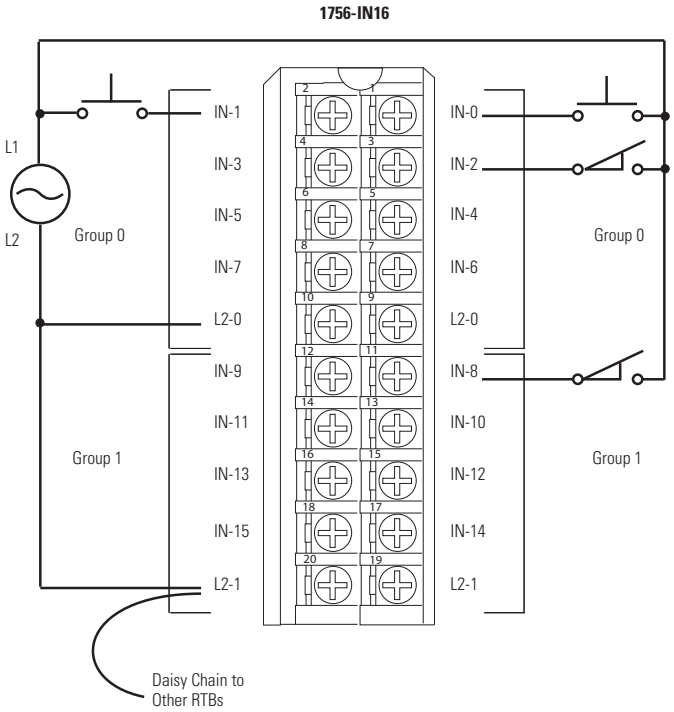
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

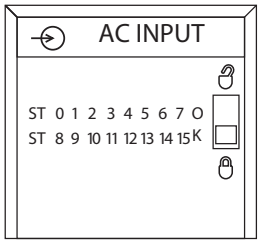
1756-IN16

ControlLogix AC (10...30V) input module

Simplified Schematic







Technical Specifications - 1756-IN16

Attribute	1756-IN16
Inputs	16 (8 points/group)
Voltage category	24V AC
Operating voltage range	10…30V AC, 47…63 Hz
Input voltage, nom	24V AC
Input delay time OFF to ON	Hardware delay: 10 ms max + filter time User-selectable filter time: 0, 1, or 2 ms
ON to OFF	Hardware delay: 10 ms max + filter time User-selectable filter time: 9 or 18 ms
Current draw @ 5.1V	100 mA
Current draw @ 24V	2 mA
Power dissipation, max	5.1 W @ 60 °C (140 °F)
Thermal dissipation	17.39 BTU/hr
Off-state voltage, max	5V
Off-state current, max	2.75 mA
On-state current, min	5 mA @ 10V AC, 60 Hz
On-state current, max	1.2 mA @ 30V AC, 60 Hz
Inrush current, max	250 mA

Technical Specifications - 1756-IN16

Attribute	1756-IN16
Input impedance, max	2.5 kΩ @ 30V AC, 60 Hz
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T3C
IEC temperature code	T3
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IN16

Attribute	1756-IN16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-IN16

Attribute	1756-IN16
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-IN16

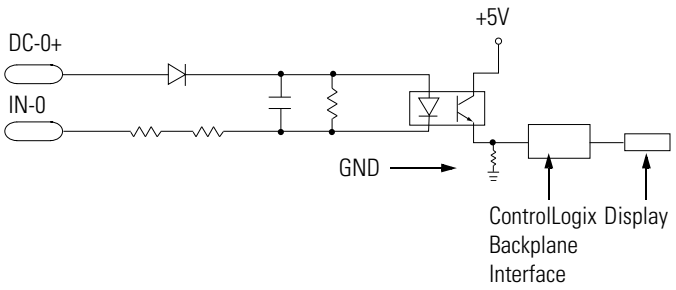
Certification[1]	1756-IN16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T3 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

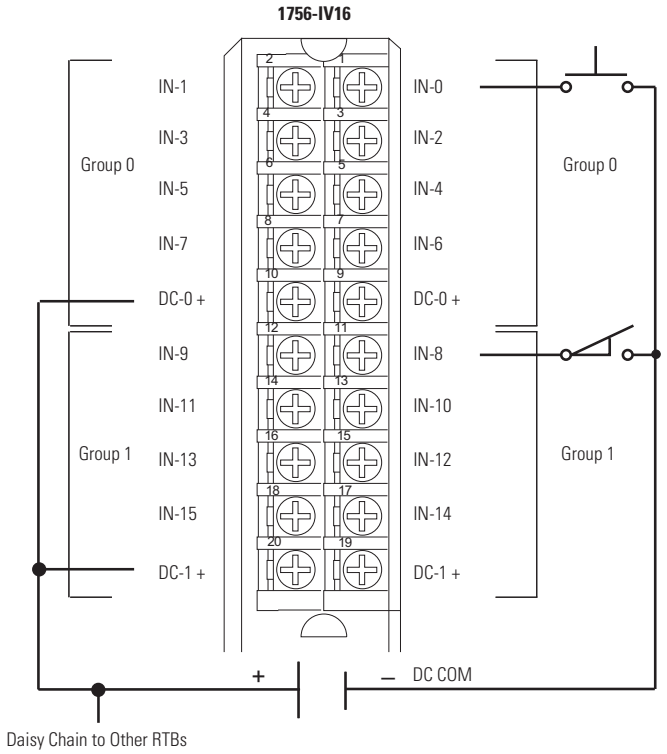
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

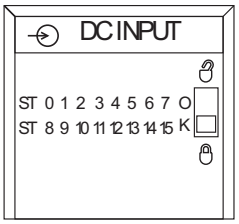
1756-IV16

ControlLogix DC (10...30V) sourcing input module

Simplified Schematic







Technical Specifications - 1756-IV16

Attribute	1756-IV16
Inputs	16 (8 points/group)
Voltage category	12/24V DC source
Operating voltage range	10...30V DC
Input voltage, nom	24V DC
Input delay time OFF to ON	Hardware delay: 280 µs nom/1 ms max + filter time User-selectable filter time: 0, 1, or 2 ms
ON to OFF	Hardware delay: 540 µs nom/2 ms max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	110 mA
Current draw @ 24V	2 mA
Power dissipation, max	5.41 W @ 60 °C (140 °F)
Thermal dissipation	18.47 BTU/hr
Off-state voltage, max	5V DC
Off-state current, max	1.5 mA
On-state current, min	2 mA @ 10V DC
On-state current, max	10 mA @ 30V DC

Technical Specifications - 1756-IV16

Attribute	1756-IV16
Inrush current, max	250 mA
Input impedance, max	3.2 kΩ@ 30V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block housing	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IV16

Attribute	1756-IV16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-IV16

Attribute	1756-IV16
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10Vr ms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

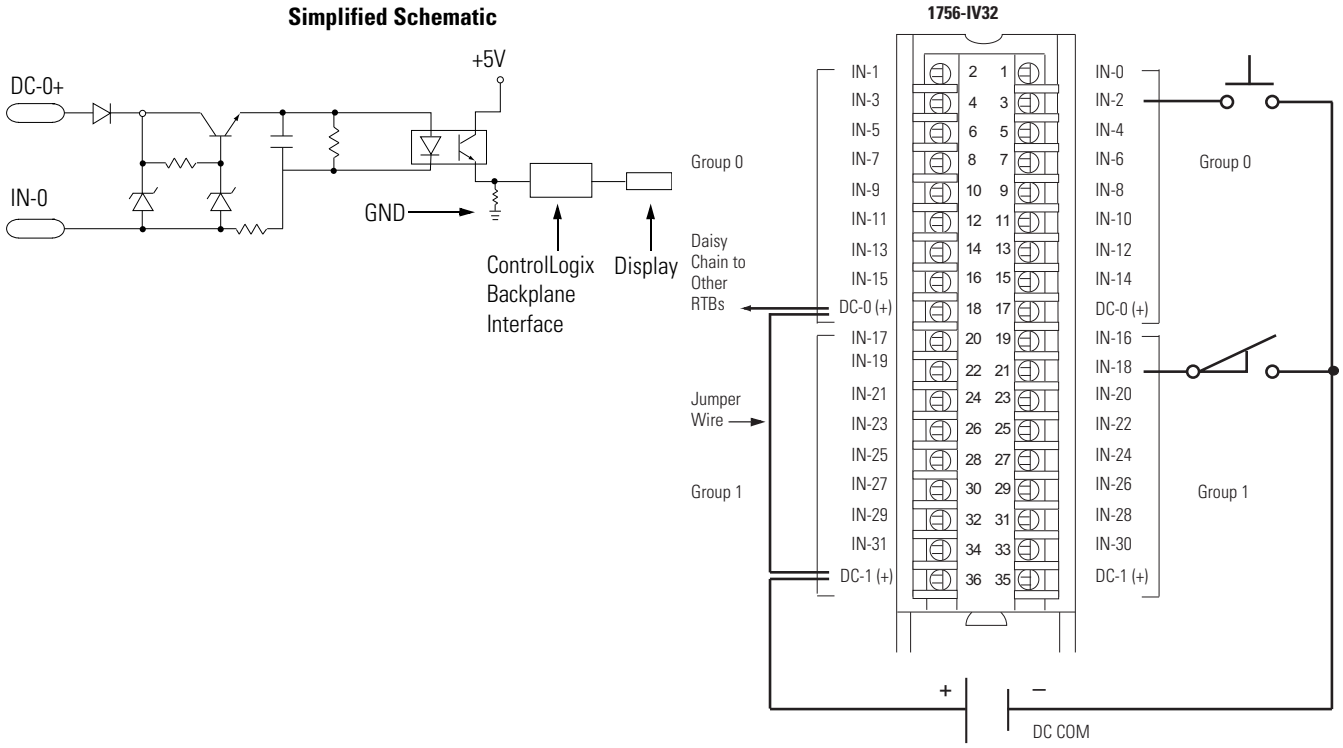
Certifications - 1756-IV16

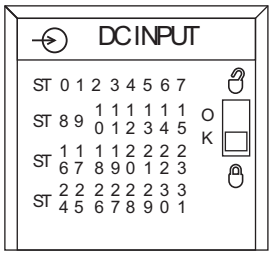
Certification[1]	1756-IV16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-IV32

ControlLogix DC (10...30V) sourcing input module





Technical Specifications - 1756-IV32

Attribute	1756-IV32
Inputs	32 (16 points/group)
Voltage category	12/24V DC source
Operating voltage range	10...30V DC
Input voltage, nom	24V DC
Input delay time OFF to ON	Hardware delay: 350 µs nom/1 ms max + filter time User-selectable filter time: 0, 1, or 2 ms
ON to OFF	Hardware delay: 540 µs nom/2 ms max + filter time User-selectable filter time: 0, 1, 2, 9, or 18 ms
Current draw @ 5.1V	120 mA
Current draw @ 24V	2 mA
Power dissipation, max	4.1 W @ 60 °C (140 °F)
Thermal dissipation	14 BTU/hr @ 60 °C (140 °F)
Off-state voltage, max	5V
Off-state current, max	1.5 mA
On-state current, min	2 mA
On-state current, max	3.5 mA
Inrush current, max	250 mA (decaying to <37% in 22 ms, without activation)

Technical Specifications - 1756-IV32

Attribute	1756-IV32
Input impedance, max	8.6 kΩ @ 30V DC
Cyclic update time	200 µs...750 ms
Isolation voltage	250V (continuous), basic insulation type, inputs-to-backplane, and input group-to-group No isolation between individual group inputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1 - on signal ports(2)
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-IV32

Attribute	1756-IV32
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-IV32

Attribute	1756-IV32
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-IV32

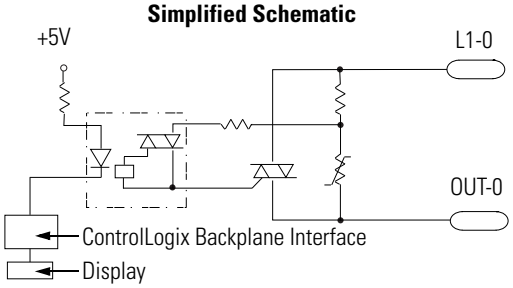
Certification[1]	1756-IV32
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

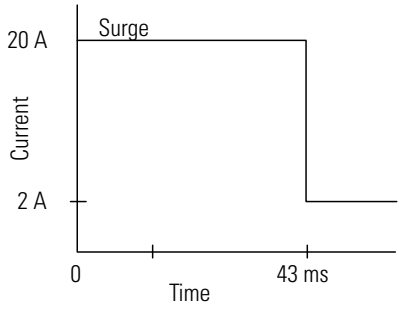
1756-OA8

ControlLogix AC (74...265V) output module

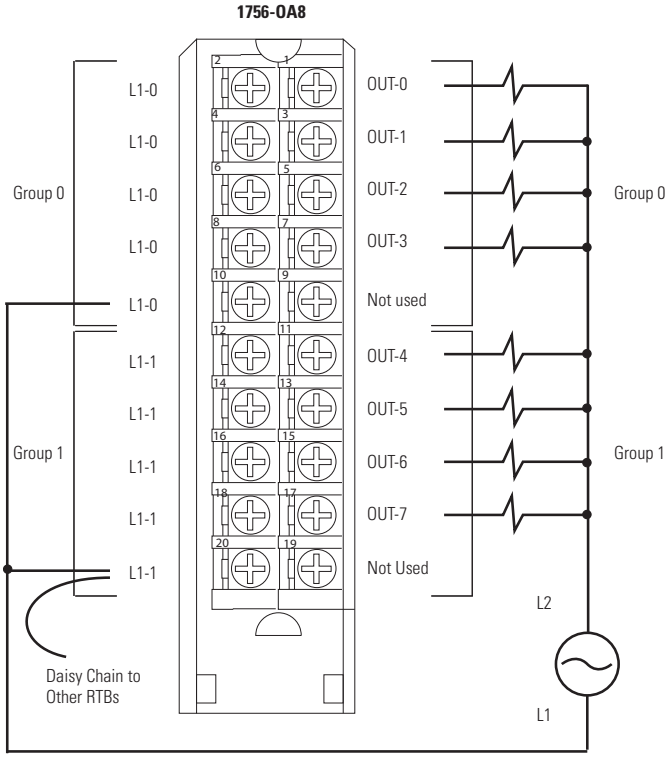
Simplified Schematic

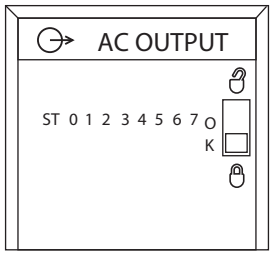


Surge Current Chart



1756-OA8





Technical Specifications - 1756-OA8

Attribute	1756-OA8
Outputs	8 (4 points/group)
Voltage category	120/240V AC
Operating voltage range	74…265V AC 47…63 Hz
Output delay time OFF to ON ON to OFF	 9.3 ms @ 60 Hz 11 ms @ 50 Hz 9.3 ms @ 60 Hz 11 ms @ 50 Hz
Current draw @ 5.1V	200 mA
Current draw @ 24V	2 mA
Power dissipation, max	5.1 W @ 60 °C (140 °F)
Thermal dissipation, max	17.39 BTU/hr
Off-state leakage current, max	3 mA per point
On-state voltage drop, max	1.5V peak @ 2 A 6V peak @ <50 mA
Current per point, max	2 A @ 60 °C (140 °F) linear derating

Technical Specifications - 1756-OA8

Attribute	1756-OA8
Current per module, max	5 A @ 30 °C (86 °F) linear derating 4 A @ 60 °C (140 °F) linear derating
Surge current per point	20 A for 43 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	10 mA per point
Commutating voltage	4V/µs for loads > 50 mA 0.2V/µs for loads < 50 mA[1]
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Inhibit voltage, max	Zero crossing 60V peak
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max[2]
Wire category	1[3]
North American temperature code	T4A
Enclosure type	None (open style)

[1] The commutating dv/dt of the output voltage (OUTPUT to L2) should not exceed 0.2V/ms for loads under 50 mA. The commutating dv/dt rating of the module for loads 50…500 mA (OUTPUT to L2) is 4V/ms maximum. If the commutating dv/dt rating of the TRIAC is exceeded, the TRIAC could latch on. If the commutating dv/dt rating is exceeded in the 10…50 mA range, a resistor may be added across the output and L2. The purpose of this resistor is to increase the total output current to 50 mA (I=V/R). At 50 mA and above, the module has a higher commutating dv/dt rating. When adding a resistor for the output to L2, be sure it is rated for the power that it will dissipate (P=(V**2)/R). If the commutating dv/dt rating is exceeded in the 50…500 mA range, the L1 AC waveform could be at fault. Be sure the waveform is a good sinusoid, void of any anomalies such as distorted or flattened sections.

[2] Maximum wire size requires extended housing, catalog number 1756-TBE.

[3] Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OA8

Attribute	1756-OA8
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz

Environmental Specifications - 1756-OA8

Attribute	1756-OA8
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OA8

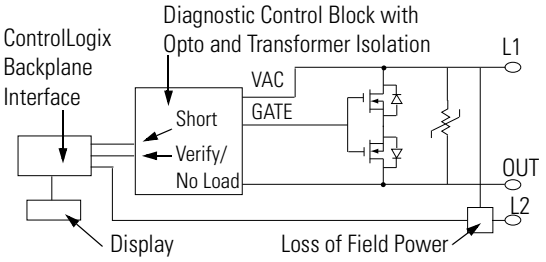
Certification[1]	1756-OA8
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

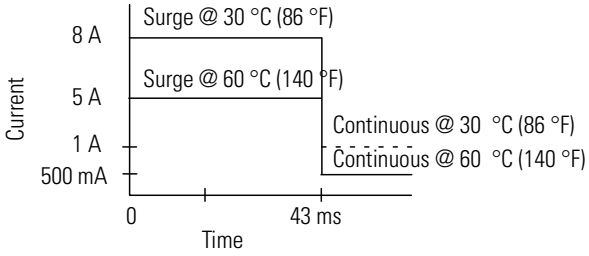
1756-OA8D

ControlLogix AC (74...132V) diagnostic output module

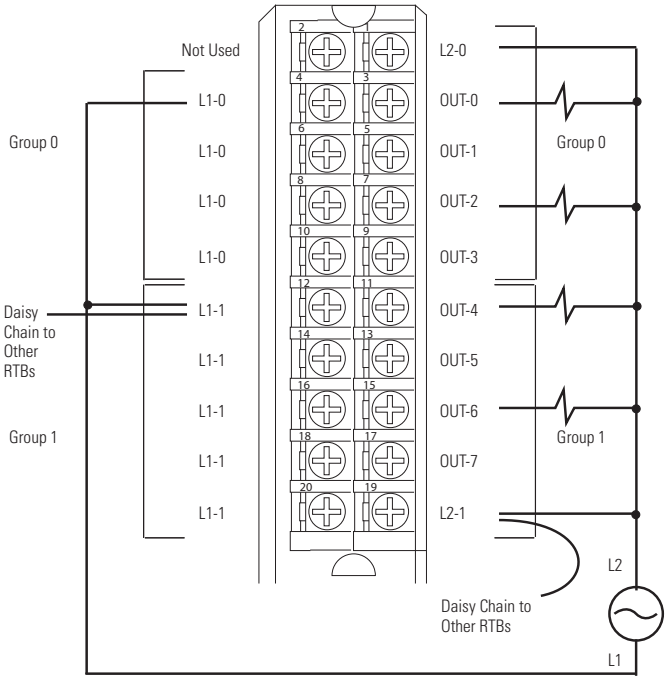
Simplified Schematic



Surge Current Chart

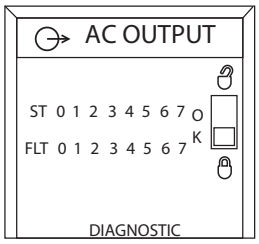


1756-OA8D



Diagnostics - 1756-OA8D

Attribute	1756-OA8D
Short trip, min	12 A for 500 µs
No load	Off-state detection only
Output verification	On-state detection only
Pulse test	Configurable max. width and max time delay from zero cross
Field power loss (zero cross)	Detects at 25V peak min (firmware phase locked loop)
Time stamp of diagnostics	±1 ms



Technical Specifications - 1756-OA8D

Attribute	1756-OA8D
Outputs	8 diagnostic, electronic fusing (4 points/group)
Voltage category	120V AC
Operating voltage range	74…132V AC 47…63 Hz

Technical Specifications - 1756-OA8D

Attribute	1756-OA8D
Output delay time OFF to ON ON to OFF	 9.3 ms @ 60 Hz 11 ms @ 50 Hz 9.3 ms @ 60 Hz 11 ms @ 50 Hz
Current draw @ 5.1V	175 mA
Current draw @ 24V	250 mA
Power dissipation, max	5.3 W @ 60 °C (140 °F)
Thermal dissipation, max	18.0 BTU/hr
Off-state leakage current, max	3 mA per point
On-state voltage drop, max	2.5V peak @ 0.5 A 3V peak @ 1 A
Current per point, max	1 A @ 30 °C (86 °F) linear derating 0.5 A @ 60 °C (140 °F) linear derating
Current per module, max	8 A @ 30 °C (86 °F) linear derating 4 A @ 60 °C (140 °F) linear derating
Surge current per point	8 A for 43 ms per point, repeatable every 2 s @ 30 °C (86 °F) 5 A for 43 ms per point, repeatable every 1 s @ 60 °C (140 °F)
Load current, min	10 mA per point
Isolation voltage	125V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1200V AC for 2 s
Inhibit voltage, max	Zero crossing 25V peak
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OA8D

Attribute	1756-OA8D
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OA8D

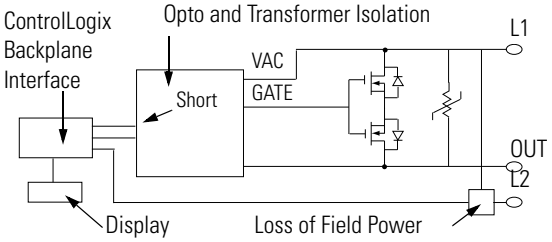
Certification[1]	1756-OA8D
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

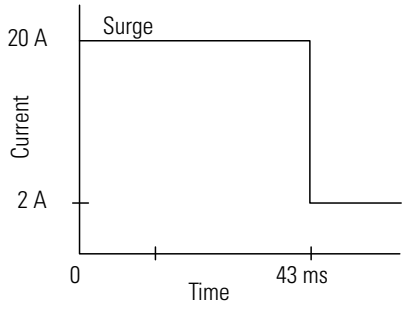
1756-OA8E

ControlLogix AC (74...132V) electronically-fused output module

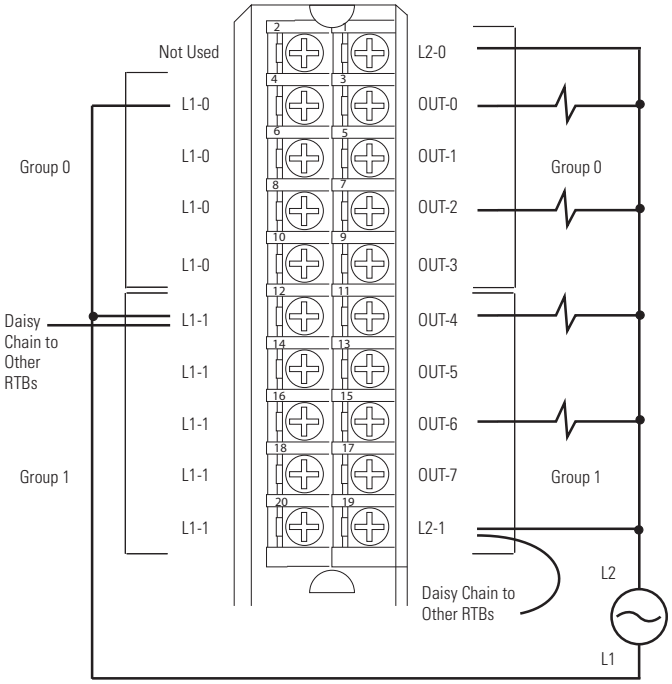
Simplified Schematic



Surge Current Chart

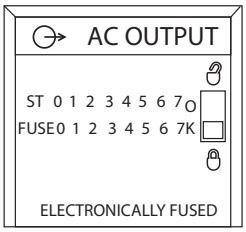


1756-OA8E



Diagnostics - 1756-OA8E

Attribute	1756-OA8E
Short trip, min	>20 A for 100 ms
Field power loss (zero cross)	Detects at 25V peak min (firmware phase locked loop)
Time stamp of diagnostics	±1 ms



Technical Specifications - 1756-OA8E

Attribute	1756-OA8E
Outputs	8 electronic fusing (4 points/group)
Voltage category	120V AC
Operating voltage range	74…132V AC 47…63 Hz
Output delay time OFF to ON	 9.3 ms @ 60 Hz 11 ms @ 50 Hz
ON to OFF	9.3 ms @ 60 Hz 11 ms @ 50 Hz
Current draw @ 5.1V	200 mA
Current draw @ 24V	250 mA

Technical Specifications - 1756-OA8E

Attribute	1756-OA8E
Power dissipation, max	5.5 W @ 60 °C (140 °F)
Thermal dissipation, max	18.76 BTU/hr
Off-state leakage current, max	3 mA per point
On-state voltage drop, max	4V peak @ 2 A
Current per point, max	2 A @ 60 °C (140 °F)
Current per module, max	8 A @ 30 °C (86 °F) linear derating 4 A @ 60 °C (140 °F) linear derating
Surge current per point	20 A for 43 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	10 mA per point
Isolation voltage	125V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1200V AC for 2 s
Inhibit voltage, max	Zero crossing 25V peak
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OA8E

Attribute	1756-OA8E
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g

Environmental Specifications - 1756-OA8E

Attribute	1756-OA8E
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OA8E

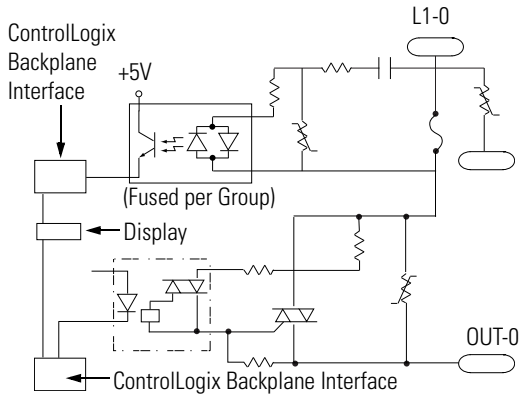
Certification[1]	1756-OA8E
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

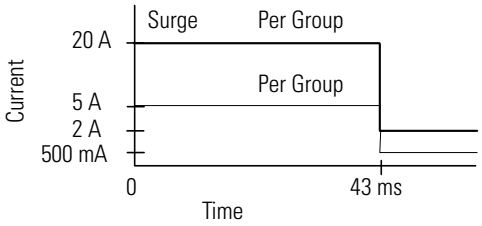
1756-OA16

ControlLogix AC (74...265V) output module

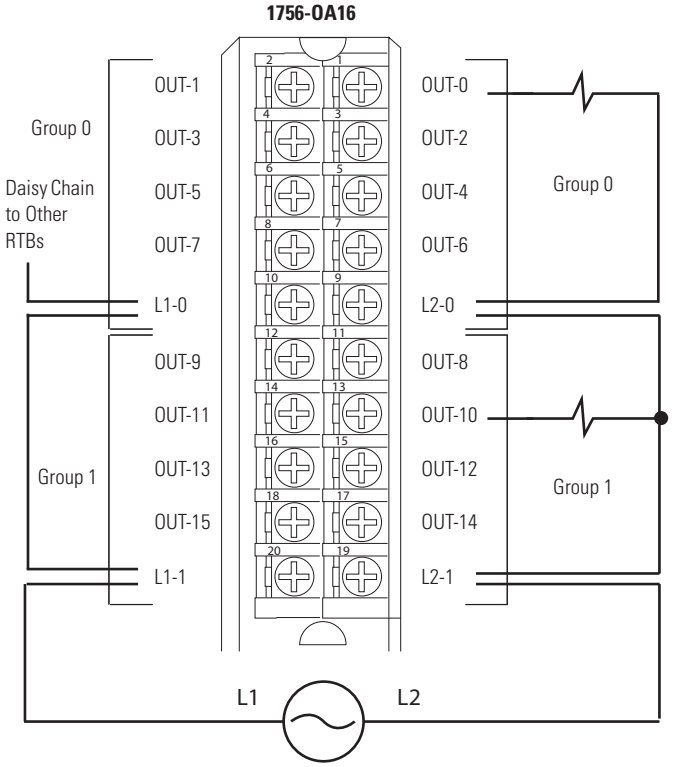
Simplified Schematic



Surge Current Chart

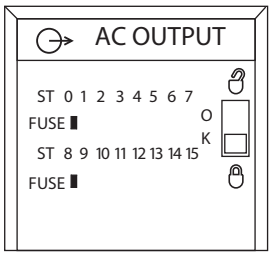


1756-OA16



Diagnostics - 1756-OA16

Attribute	1756-OA16
Time stamp of diagnostics	±1 ms
Fuse blown	1 fuse and indicator/group



Technical Specifications - 1756-OA16

Attribute	1756-OA16
Outputs	16 mechanically fused/group (8 points/group)
Voltage category	120/240V AC
Operating voltage range	74…265V AC 47…63 Hz
Output delay time OFF to ON ON to OFF	 9.3 ms @ 60 Hz 11 ms @ 50 Hz 9.3 ms @ 60 Hz 11 ms @ 50 Hz
Current draw @ 5.1V	400 mA

Technical Specifications - 1756-OA16

Attribute	1756-OA16
Current draw @ 24V	2 mA
Power dissipation, max	6.5 W @ 60 °C (140 °F)
Thermal dissipation, max	22.17 BTU/hr
Off-state leakage current, max	3 mA per point
On-state voltage drop, max	1.5V @ 0.5 A 5.7V @ load current < 50 mA
Current per point, max	0.5 A @ 60 °C (140 °F)
Current per module, max	4 A @ 60 °C (140 °F)
Surge current per point	5 A for 43 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	10 mA per point
Commutating voltage	4V/µs for loads > 50 mA 0.2V/µs for loads < 50 mA(1)
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Inhibit voltage, max	Zero crossing 60V peak
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(2)
Wire category	1(3)
North American temperature code	T4
Enclosure type	None (open style)

(1) The commutating dv/dt of the output voltage (OUTPUT to L2) should not exceed 0.2V/ms for loads under 50 mA. The commutating dv/dt rating of the module for loads 50…500 mA (OUTPUT to L2) is 4V/ms maximum. If the commutating dv/dt rating of the TRIAC is exceeded, the TRIAC could latch on. If the commutating dv/dt rating is exceeded in the 10…50 mA range, a resistor may be added AC ross the output and L2. The purpose of this resistor is to increase the total output current to 50 mA (I=V/R). At 50 mA and above, the module has a higher commutating dv/dt rating. When adding a resistor for the output to L2, be sure it is rated for the power that it will dissipate (P=(V**2)/R). If the commutating dv/dt rating is exceeded in the 50…500 mA range, the L1 AC waveform could be at fault. Be sure the waveform is a good sinusoid, void of any anomalies such as distorted or flattened sections.

(2) Maximum wire size requires extended housing, catalog number 1756-TBE.

(3) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OA16

Attribute	1756-OA16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)

Environmental Specifications - 1756-OA16

Attribute	1756-OA16
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-OA16

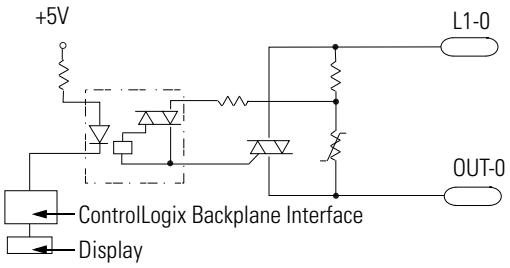
Certification[1]	1756-OA16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

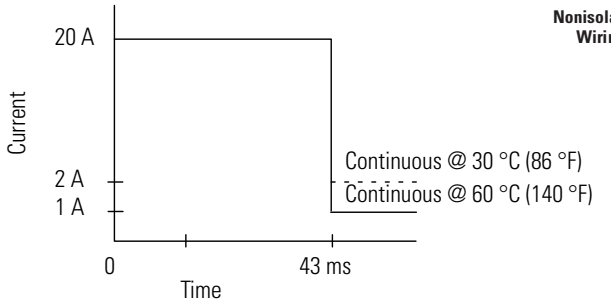
1756-OA16I

ControlLogix AC (74...265V) isolated output module

Simplified Schematic

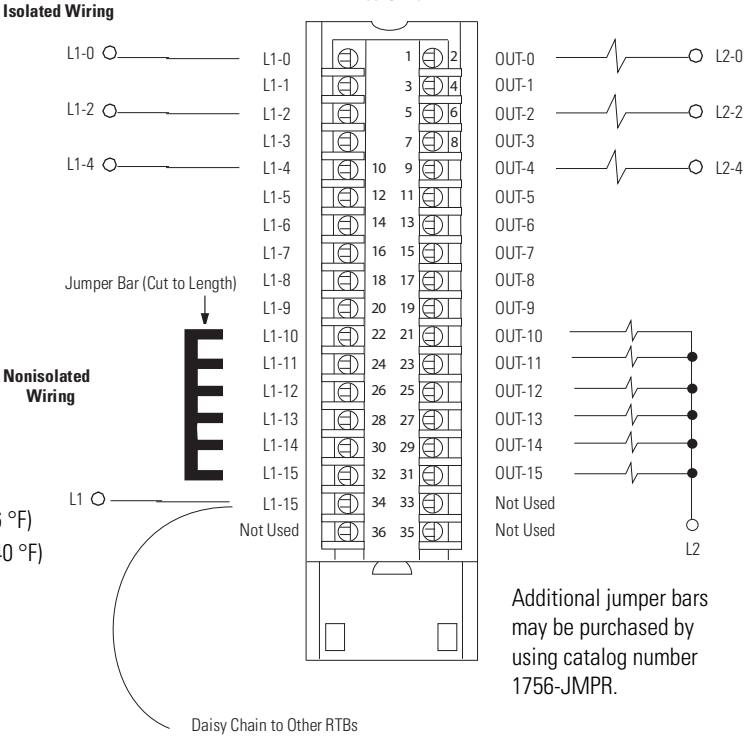


Surge Current Chart

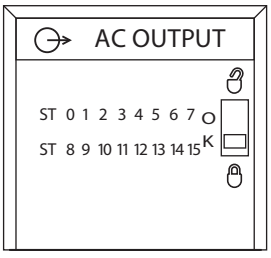


1756-OA16I

Isolated Wiring



Additional jumper bars may be purchased by using catalog number 1756-JMPR.



Technical Specifications - 1756-OA16I

Attribute	1756-OA16I
Outputs	16 individually isolated
Voltage category	120/240V AC
Operating voltage range	74…265V AC 47…63 Hz
Output delay time OFF to ON ON to OFF	 9.3 ms @ 60 Hz 11 ms @ 50 Hz 9.3 ms @ 60 Hz 11 ms @ 50 Hz
Current draw @ 5.1V	300 mA
Current draw @ 24V	2.5 mA
Power dissipation, max	5.5 W @ 60 °C (140 °F)
Thermal dissipation, max	18.76 BTU/hr
Off-state leakage current, max	3 mA per point
On-state voltage drop, max	1.5V peak @ 2 A 6V peak @ load current < 50 mA
Current per point, max	2 A @ 30 ° (86 °F) linear derating 1 A @ 60 °C (140 °F) linear derating

Technical Specifications - 1756-OA16I

Attribute	1756-OA16I
Current per module, max	5 A @ 30 °C (86 °F) linear derating 4 A @ 60 °C (140 °F) linear derating
Surge current per point	20 A for 43 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	10 mA per point
Commutating voltage	4V/µs for loads > 50 mA 0.2V/µs for loads < 50 mA[1]
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output-to-output Routine tested @ 1350V AC for 2 s
Inhibit voltage, max	Zero crossing 60V peak
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max[2]
Wire category	1[3]
North American temperature code	T4A
Enclosure type	None (open style)

[1] The commutating dv/dt of the output voltage (OUTPUT to L2) should not exceed 0.2V/ms for loads under 50 mA. The commutating dv/dt rating of the module for loads 50…500 mA (OUTPUT to L2) is 4V/ms maximum. If the commutating dv/dt rating of the TRIAC is exceeded, the TRIAC could latch on. If the commutating dv/dt rating is exceeded in the 10…50 mA range, a resistor may be added AC ross the output and L2. The purpose of this resistor is to increase the total output current to 50 mA (I=V/R). At 50 mA and above, the module has a higher commutating dv/dt rating. When adding a resistor for the output to L2, be sure it is rated for the power that it will dissipate (P=(V**2)/R). If the commutating dv/dt rating is exceeded in the 50…500 mA range, the L1 AC waveform could be at fault. Be sure the waveform is a good sinusoid, void of any anomalies such as distorted or flattened sections.

[2] Maximum wire size requires extended housing, catalog number 1756-TBE.

[3] Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OA16I

Attribute	1756-OA16I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g

Environmental Specifications - 1756-OA16I

Attribute	1756-OA16I
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-OA16I

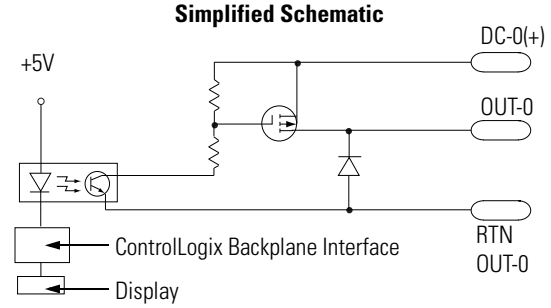
Certification[1]	1756-OA16I
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

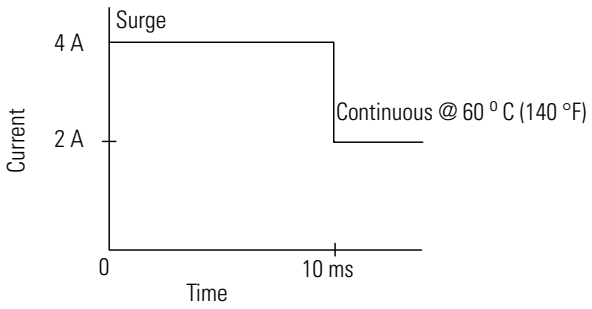
1756-OB8

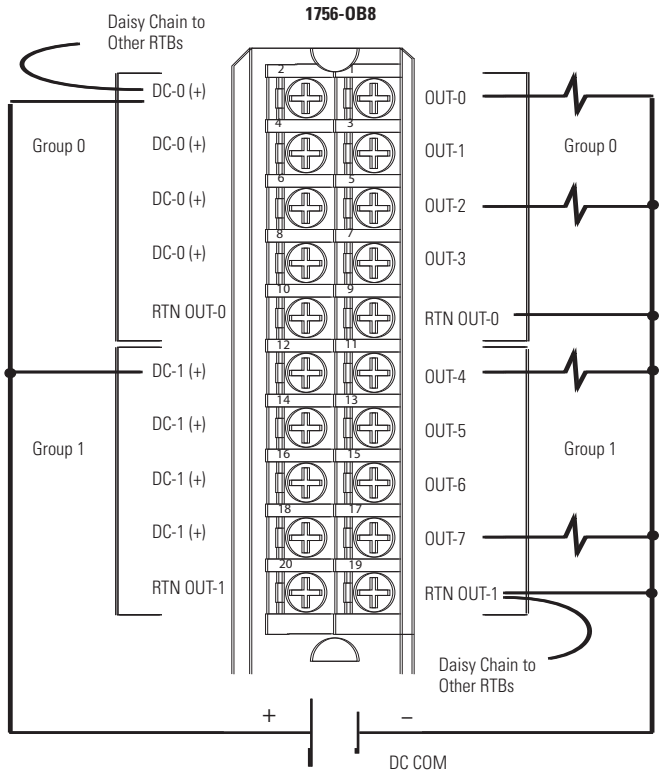
ControlLogix DC (10...30V) output module

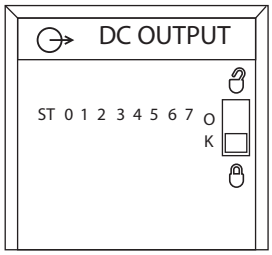
Simplified Schematic



Surge Current Chart







Technical Specifications - 1756-OB8

Attribute	1756-OB8
Outputs	8 electronically fused, individually isolated
Voltage category	12/24V DC source
Operating voltage range	10...30V DC
Output delay time OFF to ON ON to OFF	 1 ms max 2 ms max
Current draw @ 5.1V	250 mA
Current draw @ 24V	2 mA
Power dissipation, max	4.7 W @ 60 °C (140 °F)
Thermal dissipation, max	16.03 BTU/hr
Off-state leakage current, max	1 mA per point
On-state voltage drop, max	1.2V DC @ 2A
Current per point, max	2 A @ 60 °C (140 °F)
Current per module, max	16 A @ 55 °C (131 °F) linear derating 10 A @ 60 °C (140 °F)
Surge current per point	4 A for 10 ms per point, repeatable every 2 s

Technical Specifications - 1756-OB8

Attribute	1756-OB8
Load current, min	3 mA per point
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OB8

Attribute	1756-OB8
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-OB8

Attribute	1756-OB8
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OB8

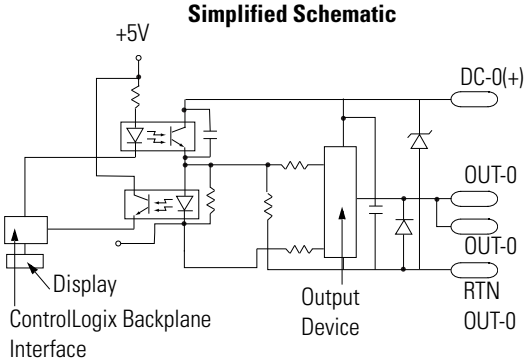
Certification[1]	1756-OB8
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

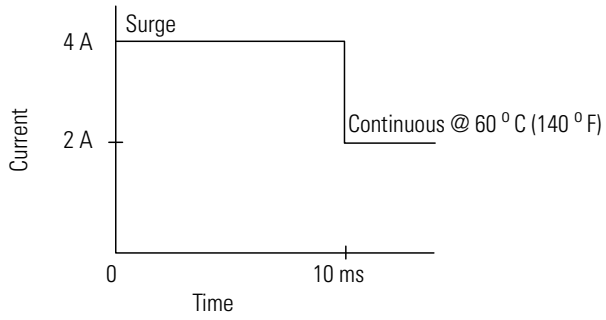
1756-OB8EI

ControlLogix DC (10...30V) electronically-fused, isolated output module

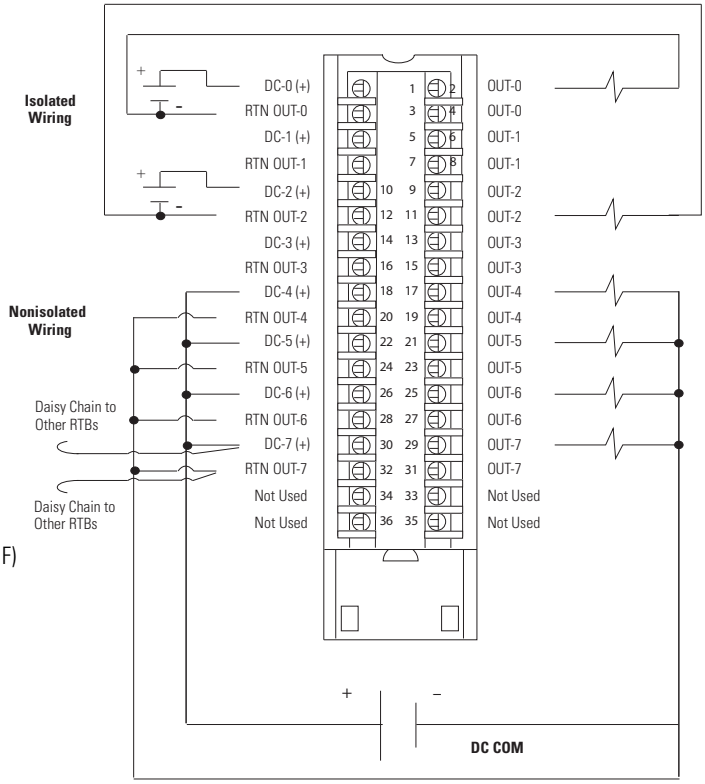
Simplified Schematic



Surge Current Chart

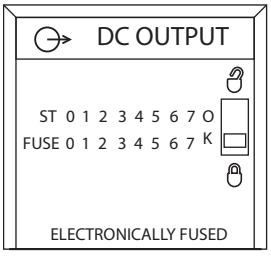


1756-OB8EI



Diagnostics - 1756-OB8EI

Attribute	1756-OB8EI
Short trip	> 4.5 A for 500 µs max (output on, then short) > 4.5 A for 1.5 ms max (output on into short)
Timestamp of diagnostics	±1 ms



Technical Specifications - 1756-OB8EI

Attribute	1756-OB8EI
Outputs	8 individually isolated
Voltage category	12/24V DC source
Operating voltage range	10...30V DC
Output delay time OFF to ON ON to OFF	 1 ms max 5 ms max
Current draw @ 5.1V	165 mA
Current draw @ 24V	2 mA
Power dissipation, max	4.7 W @ 60 °C (140 °F)

Technical Specifications - 1756-OB8EI

Attribute	1756-OB8EI
Thermal dissipation, max	16.03 BTU/hr
Off-state leakage current, max	0.5 mA per point
On-state voltage drop, max	0.5V DC @ 2 A
Current per point, max	2 A @ 60 °C (140 °F)
Current per module, max	16 A @ 60 °C (140 °F)
Surge current per point	4 A for 10 ms each, repeatable every 1 s @ 60 °C (140 °F)
Load current, min	2 mA
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output-to-output Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OB8EI

Attribute	1756-OB8EI
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges

Environmental Specifications - 1756-OB8EI

Attribute	1756-OB8EI
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OB8EI

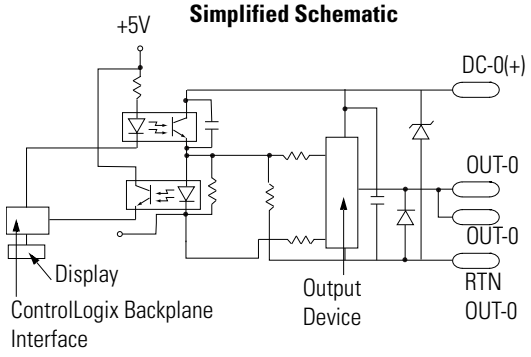
Certification[1]	1756-OB8EI
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

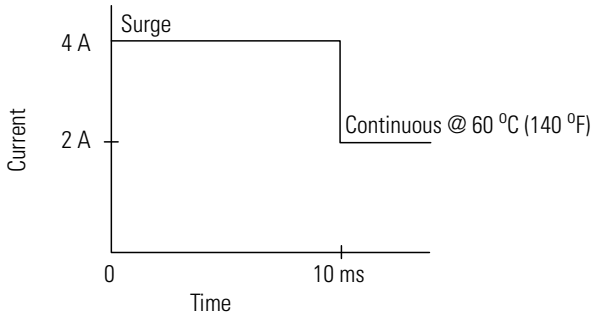
1756-OB8I

ControlLogix DC (10...30V) isolated output module

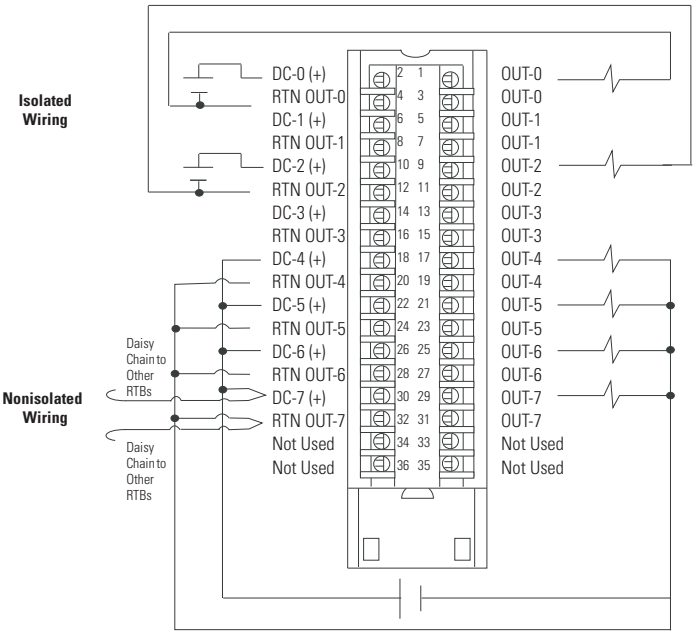
Simplified Schematic

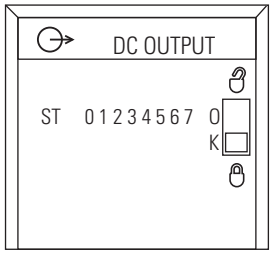


Surge Current Chart



1756-OBI





Technical Specifications - 1756-OB8I

Attribute	1756-OB8I
Outputs	8 individually isolated
Voltage category	12/24V DC source
Operating voltage range	10...30V DC
Output delay time OFF to ON ON to OFF	 1 ms max 2 ms max
Current draw @ 5.1V	165 mA
Current draw @ 24V	2 mA
Power dissipation, max	4.6W @ 60 °C (140 °F)
Thermal dissipation, max	15.70 BTU/hr
Off-state leakage current, max	0.5 mA per point
On-state voltage drop, max	0.5V DC @ 2 A
Current per point, max	2 A @ 60 °C (140 °F)
Current per module, max	16 A @ 60 °C (140 °F)
Surge current per point	4 A for 10 ms each, repeatable every 1 s @ 60 °C (140 °F)
Load current, min	2 mA

Technical Specifications - 1756-OB8I

Attribute	1756-OB8I
Isolation voltage	250V (continuous), reinforced insulation type, outputs-to-backplane 250V (continuous), basic insulation type, output-to-output Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OB8I

Attribute	1756-OB8I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

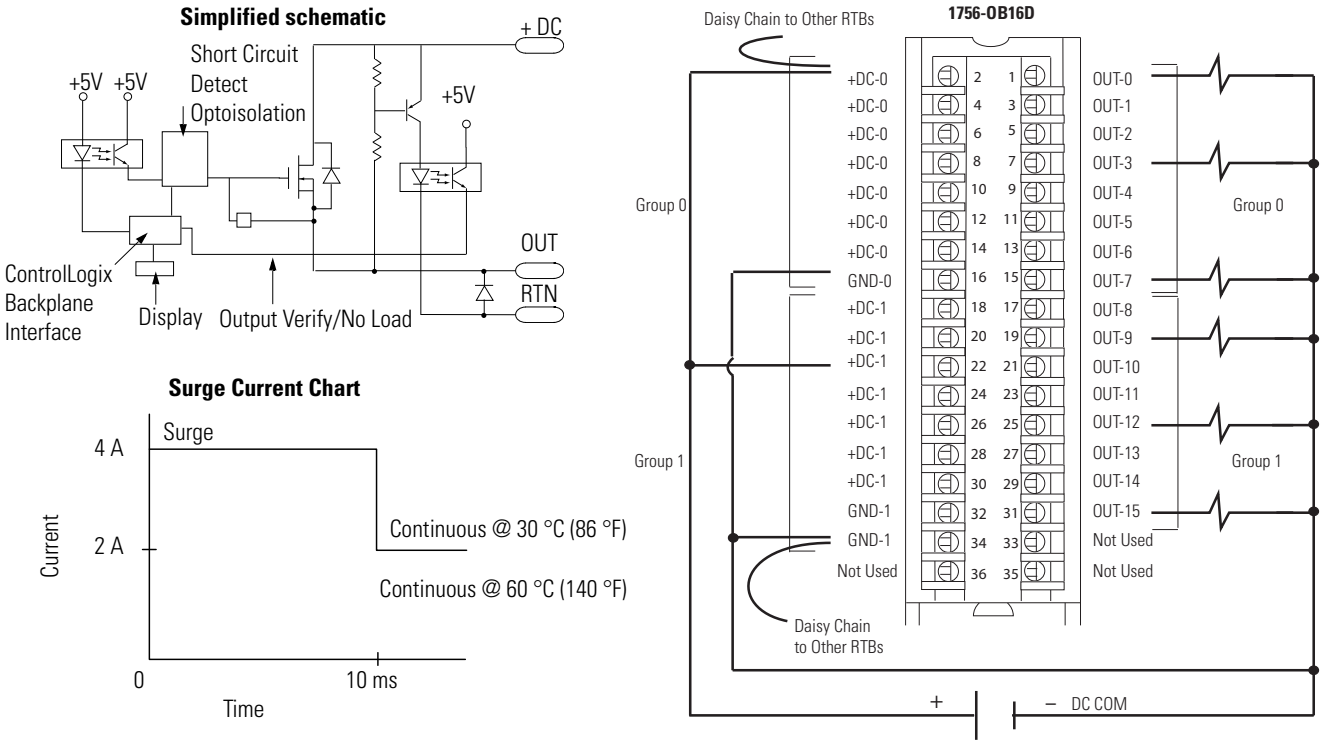
Certifications - 1756-OB8I

Certification[1]	**1756-OB8I**
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

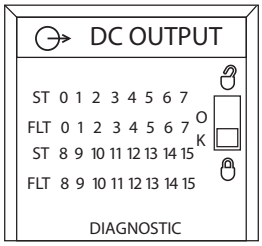
1756-OB16D

ControlLogix DC (19.2...30V) diagnostic output module



Diagnostics - 1756-OB16D

Attribute	1756-OB16D
Short trip	8 A for 180 ms 10 A for 120 ms
No load	Off-state detection only
Output verification	On-state detection only
Pulse test	Configurable max pulse width
Time stamp of diagnostics	±1 ms



Technical Specifications - 1756-OB16D

Attribute	1756-OB16D
Outputs	16 diagnostic (8 points/group)
Voltage category	24V DC source
Operating voltage range	19.2...30V DC
Output delay time OFF to ON ON to OFF	 60 µs nom/1 ms max 630 µs nom/5 ms max
Current draw @ 5.1V	250 mA

Technical Specifications - 1756-OB16D

Attribute	1756-OB16D
Current draw @ 24V	140 mA
Power dissipation, max	3.3 W @ 60 °C (140 °F)
Thermal dissipation, max	11.25 BTU/hr
Off-state leakage current per point, max	1 mA per point
On-state voltage drop, max	1.2V DC @ 2A
Current per point, max	2 A @ 30 °C (86 °F) linear derating 1 A @ 60 °C (140 °F) linear derating
Current per module, max	8 A @ 30 °C (86 °F) linear derating 4 A @ 60 °C (140 °F) linear derating
Surge current per point	4 A for 10 ms per point, repeatable every 1 s
Load current, min	3 mA per point
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OB16D

Attribute	1756-OB16D
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g

Environmental Specifications - 1756-OB16D

Attribute	1756-OB16D
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OB16D

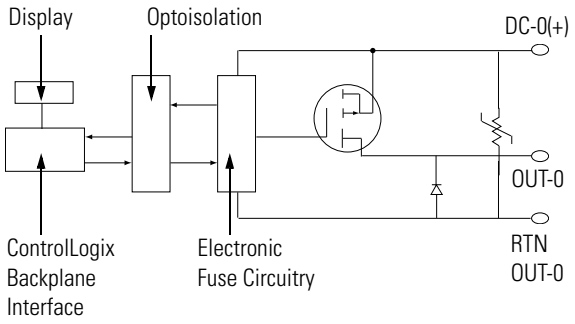
Certification[1]	1756-OB16D
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

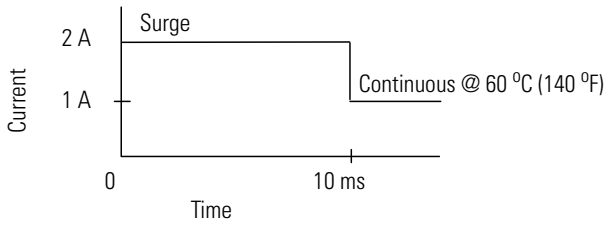
1756-OB16E

ControlLogix DC (10...31.2V) electronically-fused output module

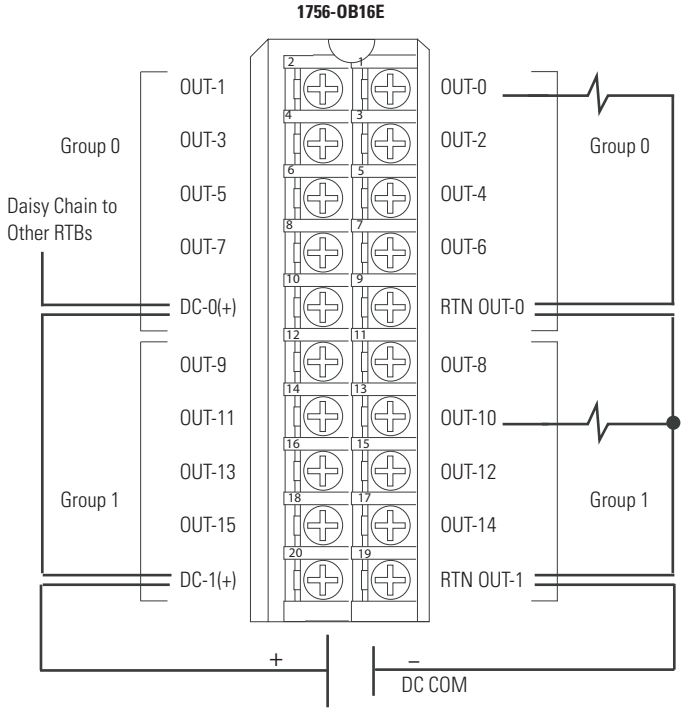
Simplified Schematic

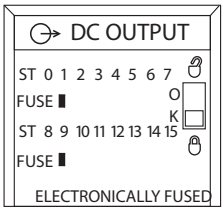


Surge Current Chart



1756-OB16E





Technical Specifications - 1756-OB16E

Attribute	1756-OB16E
Outputs	16 electronically fused (8 points/group)
Voltage category	12/24V DC source
Operating voltage range	10...31.2V DC
Output delay time OFF to ON ON to OFF	 70 µs nom/1 ms max 360 µs nom/1 ms max
Current draw @ 5.1V	250 mA
Current draw @ 24V	2 mA
Power dissipation, max	4.1 W @ 60 °C (140 °F)
Thermal dissipation, max	13.98 BTU/hr
Off-state leakage current per point, max	1 mA per point
On-state voltage drop, max	400 mV DC @ 1 A
Current per point, max	1 A @ 60 °C (140 °F)
Current per module, max	8 A @ 60 °C (140 °F)
Surge current per point	2 A for 10 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	3 mA per point

Technical Specifications - 1756-OB16E

Attribute	1756-OB16E
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OB16E

Attribute	1756-OB16E
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports

Environmental Specifications - 1756-OB16E

Attribute	1756-OB16E
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-OB16E

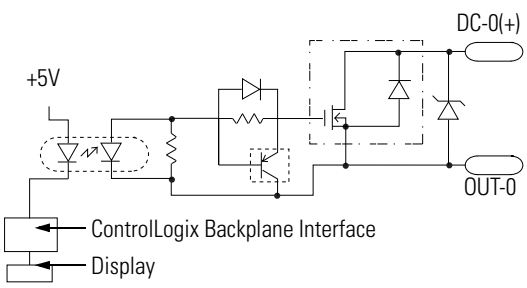
Certification[1]	1756-OB16E
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

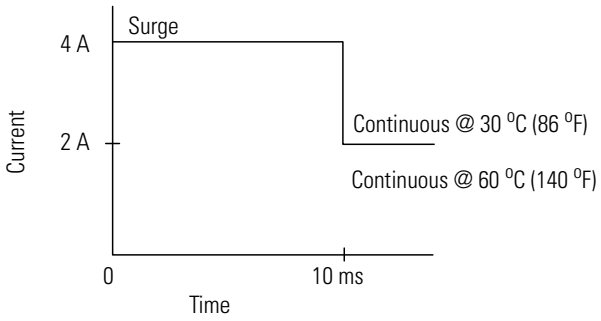
1756-OB16I

ControlLogix DC (10...30V) isolated output module

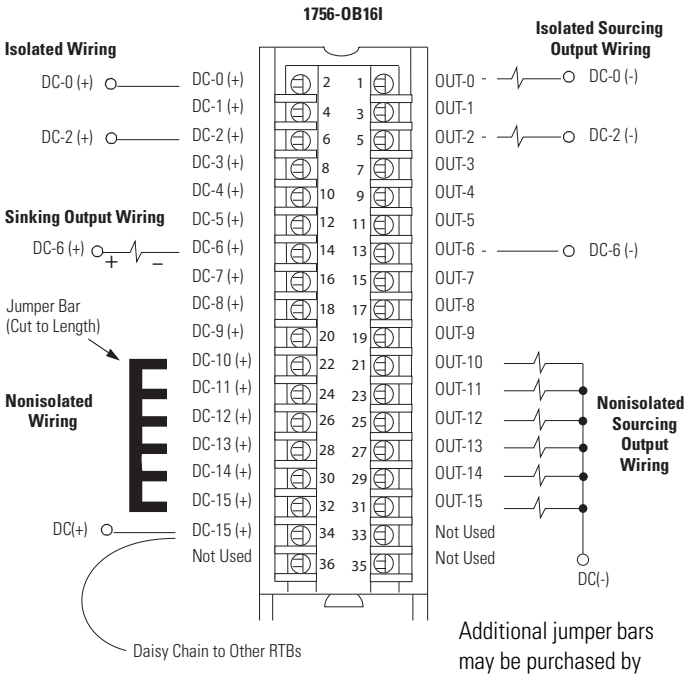
Simplified Schematic



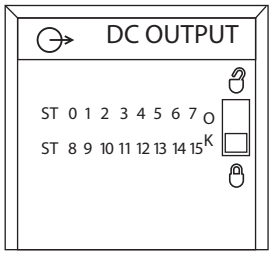
Surge Current Chart



1756-OB16I



Additional jumper bars may be purchased by using catalog number 1756-JMPR.



Technical Specifications - 1756-OB16I

Attribute	1756-OB16I
Outputs	16 individually isolated
Voltage category	12/24V DC sink/source
Operating voltage range	10...30V DC
Output delay time OFF to ON ON to OFF	 1 ms max 2 ms max
Current draw @ 5.1V	350 mA
Current draw @ 24V	2.5 mA
Power dissipation, max	3.6 W @ 60 °C (140 °F)
Thermal dissipation, max	12.28 BTU/hr
Off-state leakage current per point, max	0.5 mA per point
On-state voltage drop, max	1.2V DC @ 2 A
Current per point, max	2 A @ 30 °C (86 °F) 1 A @ 60 °C (140 °F)
Current per module, max	8 A @ 30 °C (86 °F) 4 A @ 60 °C (140 °F)
Surge current per point	4 A for 10 ms per point, repeatable every 2 s
Load current, min	1 mA per point

Technical Specifications - 1756-OB16I

Attribute	1756-OB16I
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane 125V (continuous), basic insulation type, output-to-output Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OB16I

Attribute	1756-OB16I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-OB16I

Attribute	1756-OB16I
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OB16I

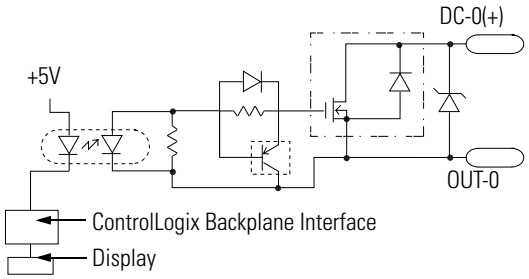
Certification[1]	1756-OB16I
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

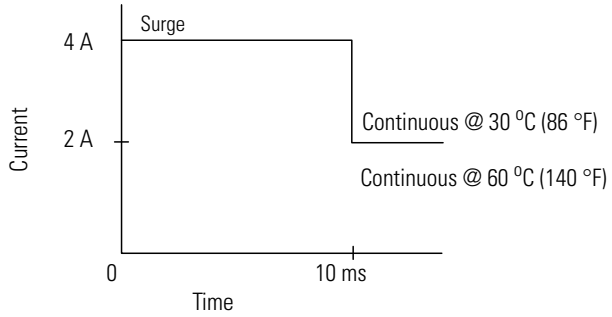
1756-OB16IS

ControlLogix DC (10...30V) scheduled, isolated output module

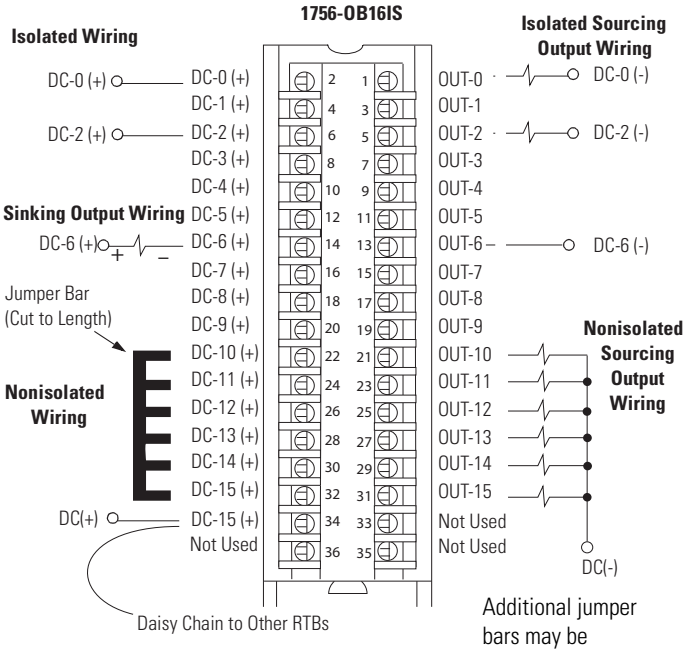
Simplified Schematic



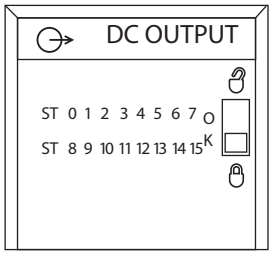
Surge Current Chart



1756-OB16IS



Additional jumper bars may be purchased by using catalog number 1756-JMPR.



Technical Specifications - 1756-OB16IS

Attribute	1756-OB16IS
Outputs	16 individually isolated, 8 scheduled
Voltage category	12/24V DC sink/source
Operating voltage range	10...30V DC
Output delay time OFF to ON ON to OFF	 1 ms max 2 ms max
Current draw @ 5.1V	350 mA
Current draw @ 24V	2.5 mA
Power dissipation, max	3.6 W @ 60 °C (140 °F)
Thermal dissipation, max	12.28 BTU/hr
Off-state leakage current per point, max	0.5 mA per point
On-state voltage drop, max	1.2V DC @ 2 A
Current per point, max	2 A @ 30 °C (86 °F) 1 A @ 60 °C (140 °F)
Current per module, max	8 A @ 30 °C (86 °F) 4 A @ 60 °C (140 °F)
Surge current per point	4 A for 10 ms per point, repeatable every 2 s
Load current, min	1 mA per point

Technical Specifications - 1756-OB16IS

Attribute	1756-OB16IS
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output-to-output Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
Wire type	Copper
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OB16IS

Attribute	1756-OB16IS
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-OB16IS

Attribute	1756-OB16IS
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OB16IS

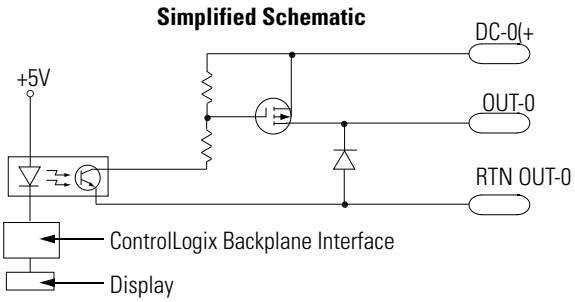
Certification[1]	1756-OB16IS
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

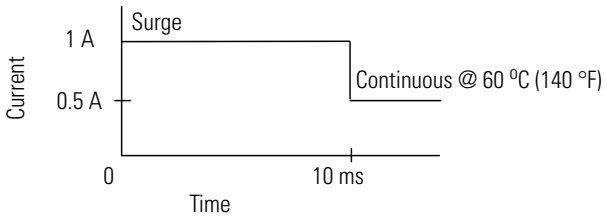
1756-OB32

ControlLogix DC (10...31.2V) output module

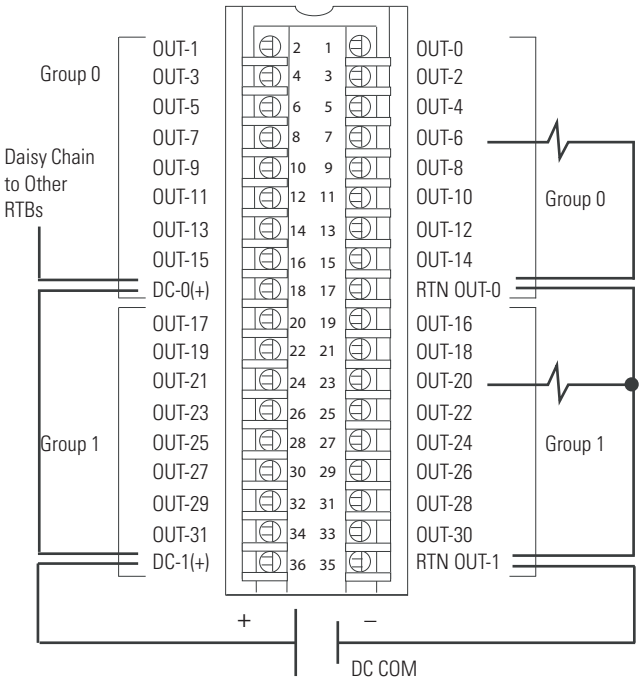
Simplified Schematic

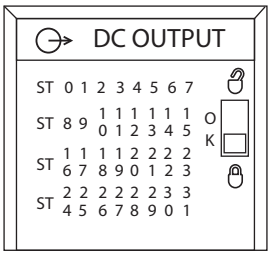


Surge Current Chart



1756-OB32





Technical Specifications - 1756-OB32

Attribute	1756-OB32
Outputs	32 (16 points/group)
Voltage category	12/24V DC source
Operating voltage range	10...31.2V DC
Output delay time OFF to ON ON to OFF	 60 µs nom/1 ms max 200 µs nom/1 ms max
Current draw @ 5.1V	300 mA
Current draw @ 24V	2 mA
Power dissipation, max	4.8 W @ 60 °C (140 °F)
Thermal dissipation, max	16.37 BTU/hr
Off-state leakage current per point, max	0.5 mA per point
On-state voltage drop, max	200 mV DC @ 0.5 A
Current per point, max	0.5 A @ 50 °C (122 °F) linear derating 0.35 A @ 60 °C (140 °F)
Current per module, max	16 A @ 50 °C (122 °F) linear derating 10 A @ 60 °C (140 °F)
Surge current per point	1 A for 10 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	3 mA per point

Technical Specifications - 1756-OB32

Attribute	1756-OB32
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T3C
IEC temperature code	T3
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OB32

Attribute	1756-OB32
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-OB32

Attribute	1756-OB32
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OB32

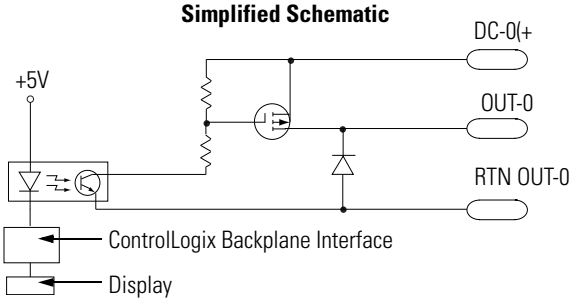
Certification[1]	1756-OB32
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T3 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

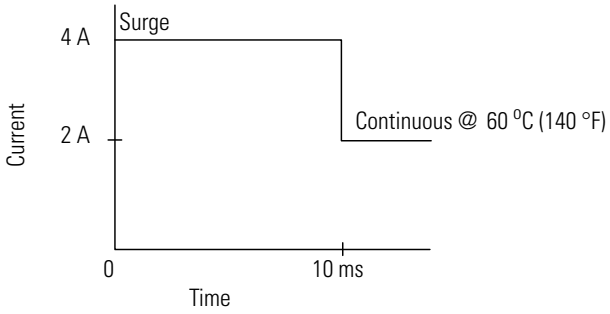
1756-OC8

ControlLogix DC (30...60V) output module

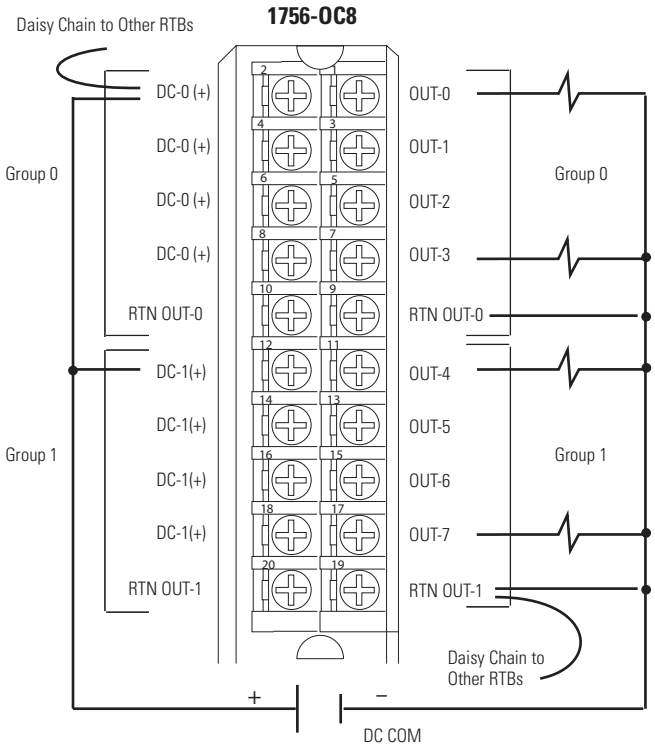
Simplified Schematic

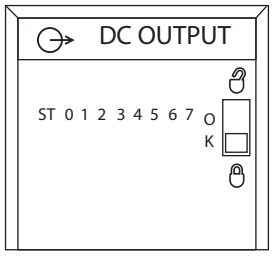


Surge Current Chart



1756-OC8





Technical Specifications - 1756-OC8

Attribute	1756-OC8
Outputs	8 (4 points/group)
Voltage category	48V DC source
Operating voltage range	30...60V DC
Output delay time OFF to ON ON to OFF	 1 ms max 2 ms max
Current draw @ 5.1V	165 mA
Current draw @ 24V	2 mA
Power dissipation, max	4.9 W @ 60 °C (140 °F)
Thermal dissipation, max	16.71 BTU/hr
Off-state leakage current, max	1 mA per point
On-state voltage drop, max	2V DC @ 2 A
Current per point, max	2 A @ 60 °C (140 °F)
Current per module, max	8 A @ 60 °C (140 °F)
Surge current per point	4 A for 10 ms per point, repeatable every 1 s @ 60 °C (140 °F)
Load current, min	2 mA per point

Technical Specifications - 1756-OC8

Attribute	1756-OC8
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested at 1350V AC for 2 s
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OC8

Attribute	1756-OC8
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz

Environmental Specifications - 1756-OC8

Attribute	1756-OC8
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OC8

Certification[1]	1756-OC8
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

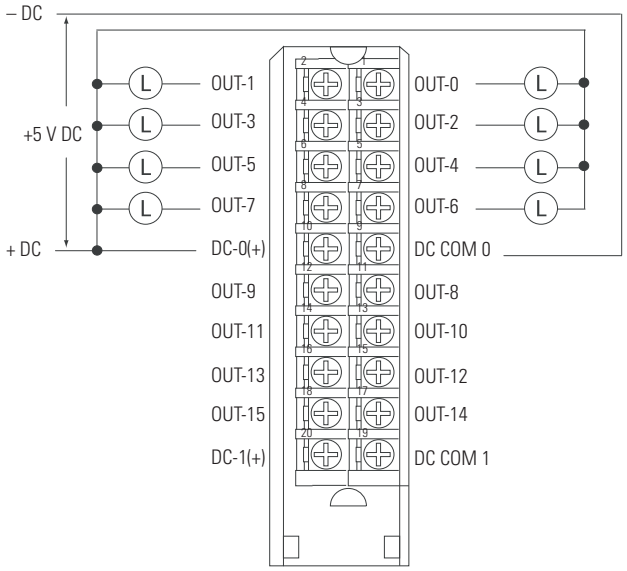
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-OG16

ControlLogix TTL output module

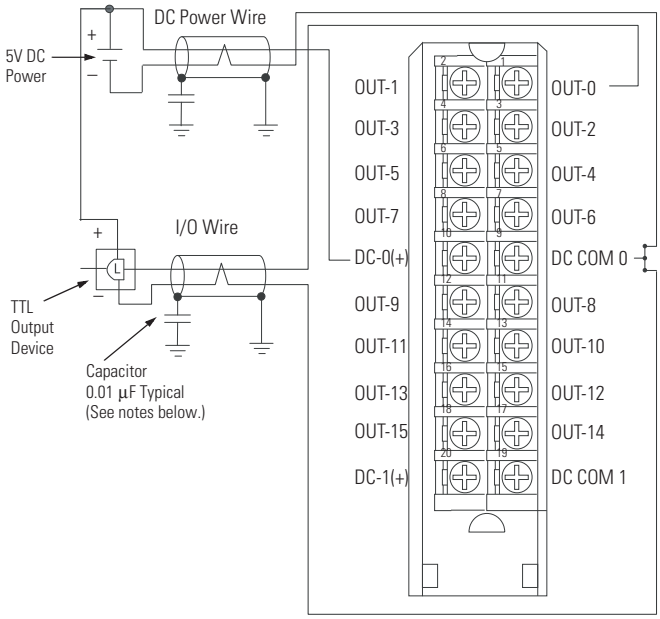
Standard Wiring

1756-OG16

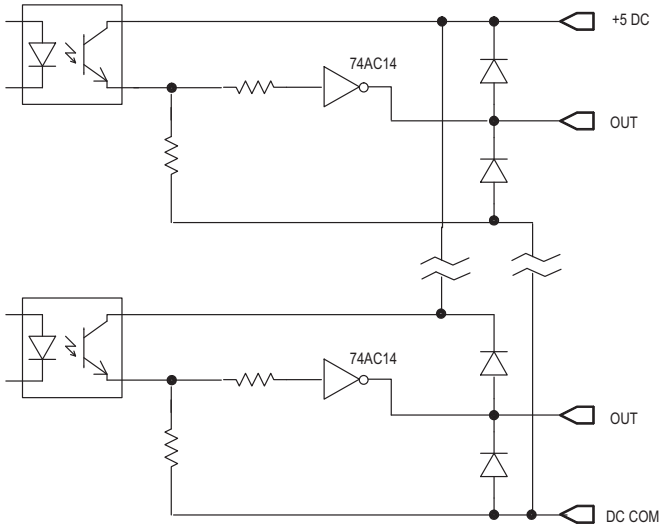


CE Compliant Wiring

1756-OG16

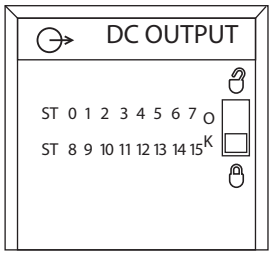


Simplified Schematic



Low to True Format - 1756-OG16

- 0…0.4V DC = Output guaranteed to be in on-state
- 0.4…4.5V DC = Output state not guaranteed
- 4.5…5.5V DC = Output guaranteed to be in off-state



Technical Specifications - 1756-OG16

Attribute	1756-OG16
Outputs	16 (8 points/group)
Voltage category	5V DC TTL (Low=True[1]
Operating voltage range	4.5...5.5V DC source 50 mV P-P ripple max
Output delay time OFF to ON ON to OFF	 45 µs nom/450 µs max 145 µs nom/700 µs max
Current draw @ 5.1V	210 mA
Current draw @ 24V	2 mA
Power dissipation, max	1.5 W @ 60 °C (140 °F)
Thermal dissipation, max	5.2 BTU/hr @ 60 °C (140 °F)
Off-state leakage current per point, max	0.1 mA per point
On-state voltage drop, max	0.4V DC
Current per point, max	24 mA @ 60 °C (140 °F)
Current per module, max	384 mA @ 60 °C (140 °F)
Load current, min	0.15 mA per point
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max[2]
Wire category	2[3]
North American temperature code	T5
IEC temperature code	T5
Enclosure type	None (open-style)

(1) TTL outputs are inverted (0 to +0.4V dc = low voltage = True = On.) Use a NOT instruction in your program to convert to traditional True - High logic.

(2) Maximum wire size requires extended housing, catalog number 1756-TBE.

(3) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OG16

Attribute	1756-OG16
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OG16

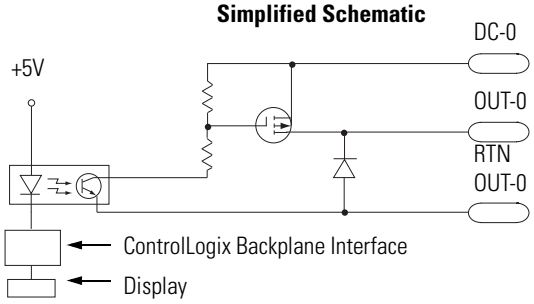
Certification[1]	1756-OG16
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T5 X

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

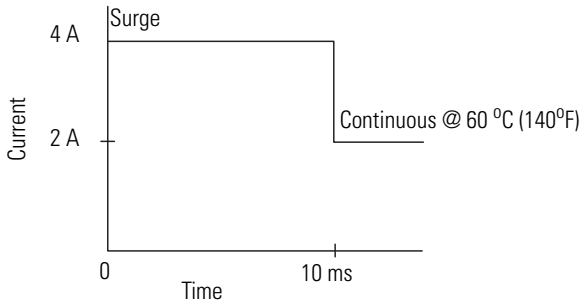
1756-OH8I

ControlLogix DC (90...146V) isolated output module

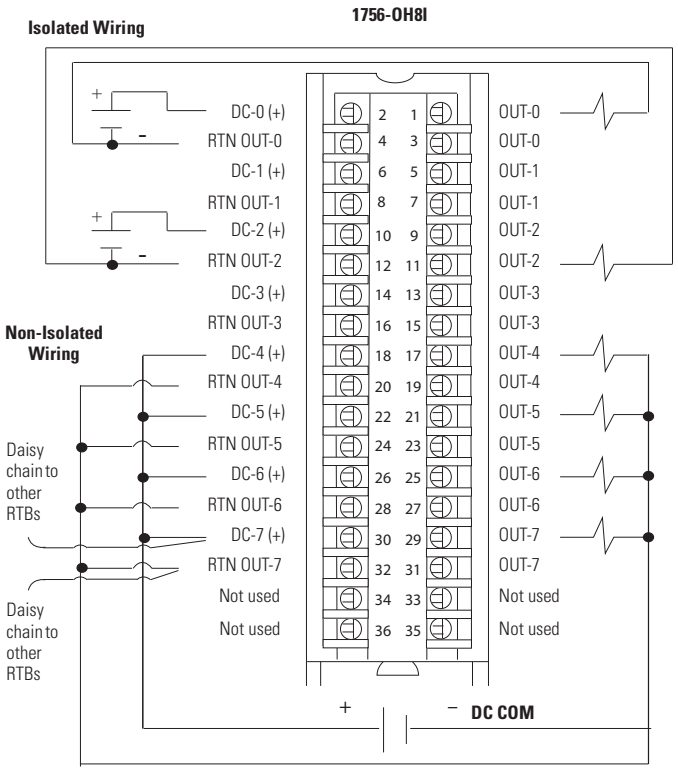
Simplified Schematic

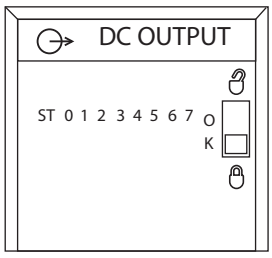


Surge Current Chart



Isolated Wiring **1756-OH8I**





Technical Specifications - 1756-OH8I

Attribute	1756-OH8I
Outputs	8 individually isolated
Voltage category	120V DC sink/source
Operating voltage range	90...146V DC
Output delay time OFF to ON ON to OFF	 2 ms max 2 ms max
Current draw @ 5.1V	210 mA
Current draw @ 24V	2 mA
Power dissipation, max	3.3 W @ 60 °C (140 °F)
Thermal dissipation, max	11.25 BTU/hr
Off-state leakage current, max	1 mA per point
On-state voltage drop, max	2V DC @ 2 A
Current per point, max	2 A @ 60 °C (140 °F)
Current per module, max	8 A @ 60 °C (140 °F)
Surge current per point	4 A for 10 ms per point, repeatable every 1 s @ 60 °C (140 °F)
Load current, min	2 mA per point

Technical Specifications - 1756-OH8I

Attribute	1756-OH8I
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output-to-output Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OH8I

Attribute	1756-OH8I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OH8I

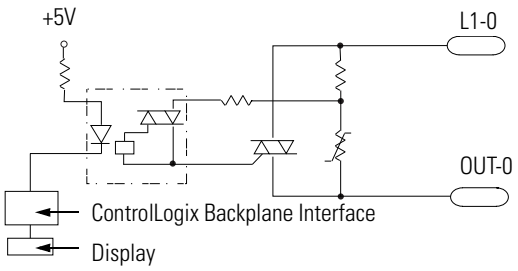
Certification[1]	**1756-OH8I**
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

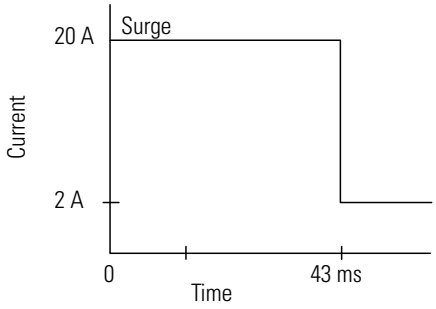
1756-ON8

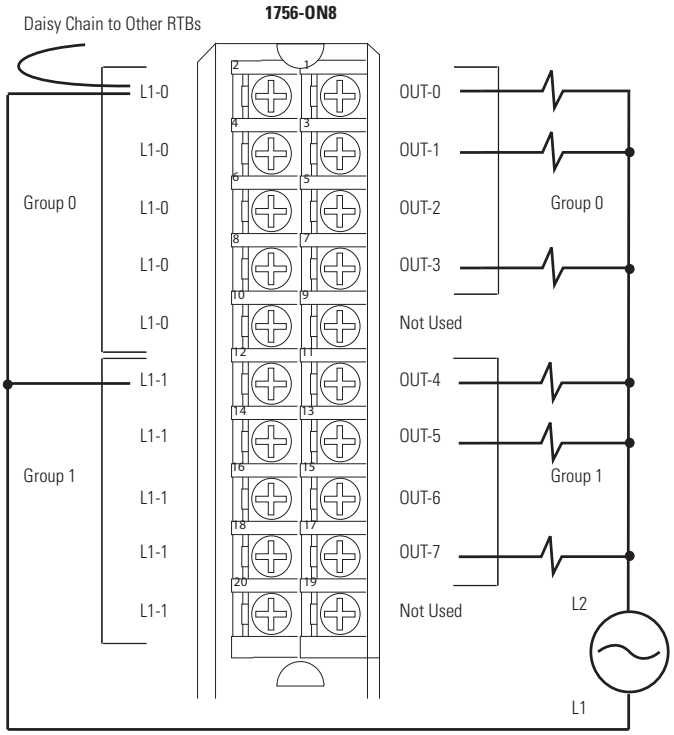
ControlLogix AC (10...30V) output module

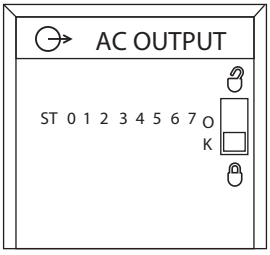
Simplified Schematic



Surge Current Chart







Technical Specifications - 1756-ON8

Attribute	1756-ON8
Outputs	8 (4 points/group)
Voltage category	24V AC
Operating voltage range	10…30V AC, current >50 mA, 47…63 Hz 16…30V AC, current <50 mA, 47…63 Hz
Output delay time OFF to ON	 9.3 ms @ 60 Hz 11 ms @ 50 Hz
ON to OFF	9.3 ms @ 60 Hz 11 ms @ 50 Hz
Current draw @ 5.1V	200 mA
Current draw @ 24V	2 mA
Power dissipation, max	5.1 W @ 60 °C (140 °F)
Thermal dissipation, max	17.39 BTU/hr
Off-state leakage current, max	3 mA per point
On-state voltage drop, max	1.5V peak @ 2 A 6V peak @ < 50 mA
Current per point, max	2 A @ 60 °C (140 °F)

Technical Specifications - 1756-ON8

Attribute	1756-ON8
Current per module, max	5 A @ 30 °C (86 °F) linear derating 4 A @ 60 °C (140 °F) linear derating
Surge current per point	20 A for 43 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	10 mA per point
Commutating voltage	4V/µs for loads > 50 mA 0.2V/µs for loads < 50 mA[1]
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max[2]
Wire category	1[3]
North American temperature code	T4A
IEC temperature code	T4
Enclosure type	None (open style)

(1) The commutating dv/dt of the output voltage (OUTPUT to L2) should not exceed 0.2V/ms for loads under 50 mA. The commutating dv/dt rating of the module for loads 50…500 mA (OUTPUT to L2) is 4V/ms maximum. If the commutating dv/dt rating of the TRIAC is exceeded, the TRIAC could latch on. If the commutating dv/dt rating is exceeded in the 10…50 mA range, a resistor may be added AC ross the output and L2. The purpose of this resistor is to increase the total output current to 50 mA (I=V/R). At 50 mA and above, the module has a higher commutating dv/dt rating. When adding a resistor for the output to L2, be sure it is rated for the power that it will dissipate (P=(V**2)/R). If the commutating dv/dt rating is exceeded in the 50…500 mA range, the L1 AC waveform could be at fault. Be sure the waveform is a good sinusoid, void of any anomalies such as distorted or flattened sections.

(2) Maximum wire size requires extended housing, catalog number 1756-TBE.

(3) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-ON8

Attribute	1756-ON8
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz

Environmental Specifications - 1756-ON8

Attribute	1756-ON8
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-ON8

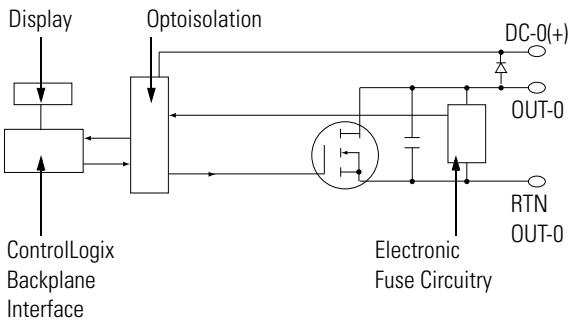
Certification[1]	1756-ON8
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

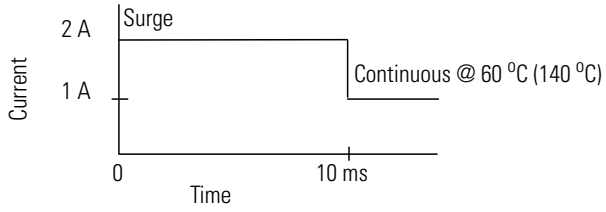
1756-OV16E

ControlLogix DC (10...30V) electronically-fused, sinking output module

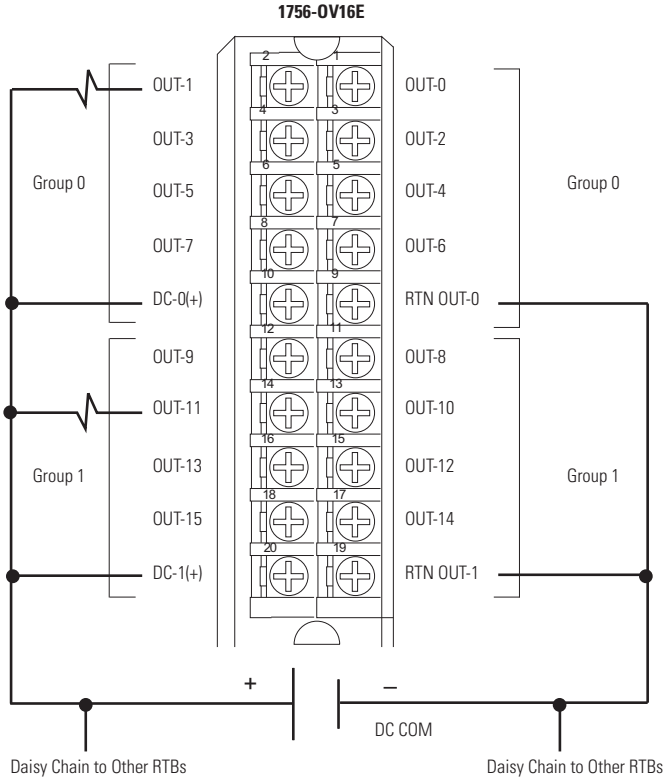
Simplified Schematic



Surge Current Chart

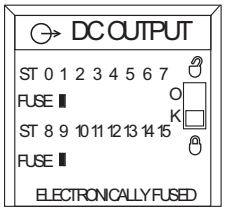


1756-OV16E



Diagnostics - 1756-OV16E

Attribute	1756-OV16E
Short trip	5 A for 20 ms @ 24V DC (output on, then short) 5 A for 20 ms @ 24V DC (output on into short)
Time stamp of diagnostics	±1 ms



Technical Specifications - 1756-OV16E

Attribute	1756-OV16E
Outputs	16 electronically fused (8 points/group)
Voltage category	12/24V DC sink
Output delay time OFF to ON ON to OFF	 75 µs nom/1 ms max 360 µs nom/1 ms max
Operating voltage range	10...30V DC
Current draw @ 5.1V	210 mA
Current draw @ 24V	2 mA

Technical Specifications - 1756-OV16E

Attribute	1756-OV16E
Power dissipation, max	6.72 W @ 60 °C (140 °F)
Thermal dissipation, max	22.94 BTU/hr
Off-state leakage current per point, max	1 mA per point
On-state voltage drop, max	700 mV DC @ 1 A
Current per point, max	1 A @ 60 °C (140 °F)
Current per module, max	8 A @ 60 °C (140 °F)
Surge current per point	2 A for 10 ms per Point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	2 mA per point
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBNH 1756-TBSH
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OV16E

Attribute	1756-OV16E
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g

Environmental Specifications - 1756-OV16E

Attribute	1756-OV16E
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OV16E

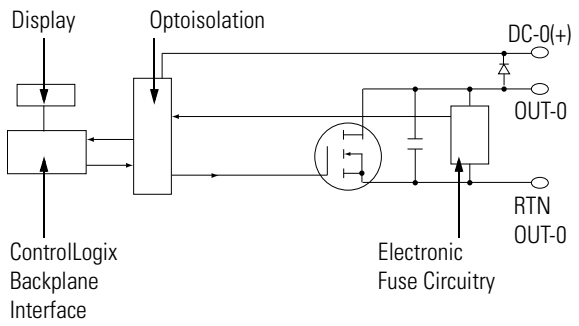
Certification[1]	1756-OV16E
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

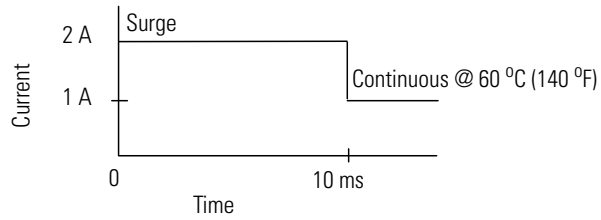
1756-OV32E

ControlLogix DC (10...30V) electronically-fused, sinking output module

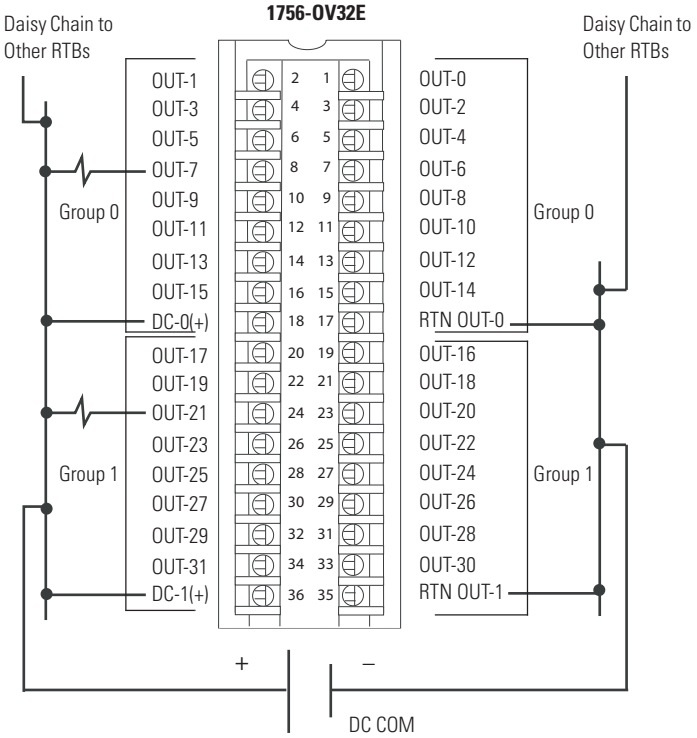
Simplified Schematic



Surge Current Chart

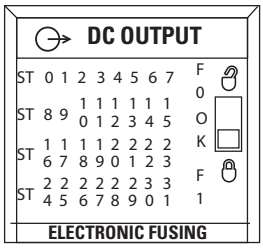


1756-OV32E



Diagnostics - 1756-OV32E

Attribute	1756-OV32E
Short trip	5 A for 20 ms @ 24V DC (output on then short) 5 A for 20 ms @ 24V DC (output into short)
Time stamp of diagnostics	±1 ms



Technical Specifications - 1756-OV32E

Attribute	1756-OV32E
Outputs	32 electronically fused (16 points/group)
Voltage category	12/24V DC sink
Operating voltage range	10...30V DC
Output delay time (24V to 0V DC transition) OFF to ON ON to OFF	 75 µs nom/300 µs max 230 µs nom/1 ms max
Current draw @ 5.1V	390 mA
Current draw @ 24V	2 mA
Power dissipation, max	5.88 W @ 60 °C (140 °F)
Thermal dissipation, max	20.1 BTU/hr

Technical Specifications - 1756-OV32E

Attribute	1756-OV32E
Off-state leakage current per point, max	1 mA per point
On-state voltage drop, max	350 mV DC @ 0.5 A
Current per point, max	0.5 A @ 50 °C (122 °F) linear derating 0.35 A @ 60 °C (140 °F)
Current per module, max	16 A @ 50 °C (122 °F) linear derating 10 A @ 60 °C (140 °F)
Surge current per point	2 A for 10 ms per point, repeatable every 2 s @ 60 °C (140 °F)
Load current, min	2 mA per output
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output group-to-group No isolation between individual group outputs Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4
IEC temperature code	T4
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OV32E

Attribute	1756-OV32E
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A

Environmental Specifications - 1756-OV32E

Attribute	1756-OV32E
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz

Certifications - 1756-OV32E

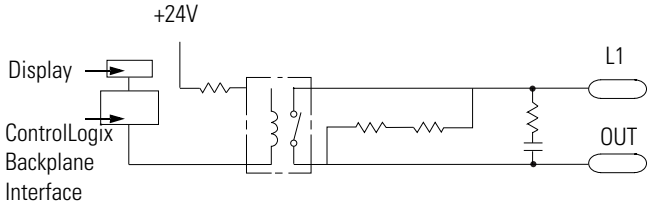
Certification[1]	1756-OV32E
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers (Clause 11)
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
Ex	European Union 94/9/EC ATEX Directive, compliant with: • EN 60079-15; Potentially Explosive Atmospheres, Protection "n" • EN 60079-0; General Requirements II 3 G Ex nA IIC T4 X

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

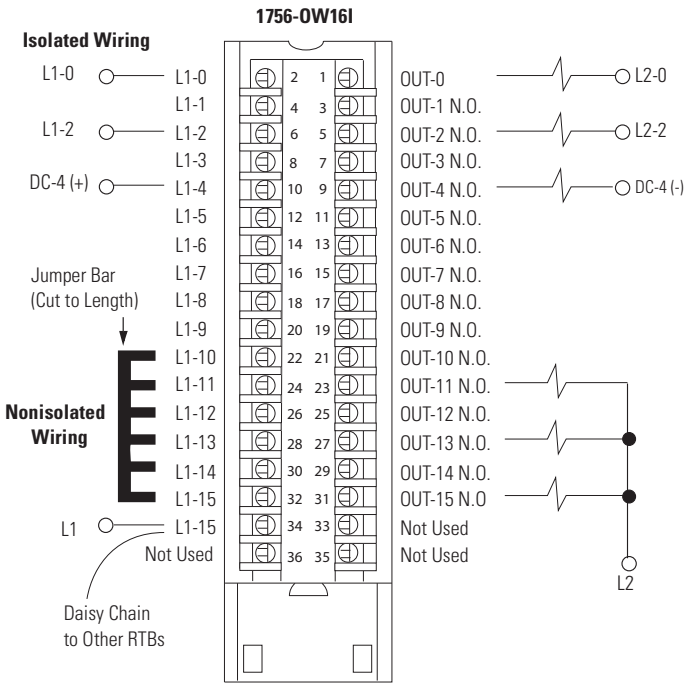
1756-OW16I

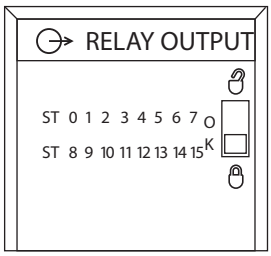
ControlLogix AC (10...240V) DC (5...125V) isolated contact module

Simplified Schematic



Additional jumper bars may be purchased by using catalog number 1756-JMPR.





Technical Specifications - 1756-OW16I

Attribute	1756-OW16I
Outputs	16 N.O. individually isolated
UL module rating	UL C300 R150
Operating voltage range	5...125V DC 10...240V AC
Contact current rating	2 A @ 5…30V DC 0.5 A @ 48V DC 0.25 A @ 125V DC 2 A @ 125/240V AC
Output delay time OFF to ON ON to OFF	 10 ms max 10 ms max
Current draw @ 5.1V	150 mA
Current draw @ 24V	150 mA
Power dissipation, max	4.5 W @ 60 °C (140 °F)
Thermal dissipation, max	15.35 BTU/hr
Off-state leakage current per point, max	1.5 mA per point
Initial contact resistance, max	100 mΩ
Switching frequency, max	1 operation/3 s (0.3 Hz at rated load)
Bounce time, mean	1.2 ms
Expected contact life	300 K cycles resistive 100 K cycles inductive

Technical Specifications - 1756-OW16I

Attribute	1756-OW16I
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output-to-output Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OW16I

Attribute	1756-OW16I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

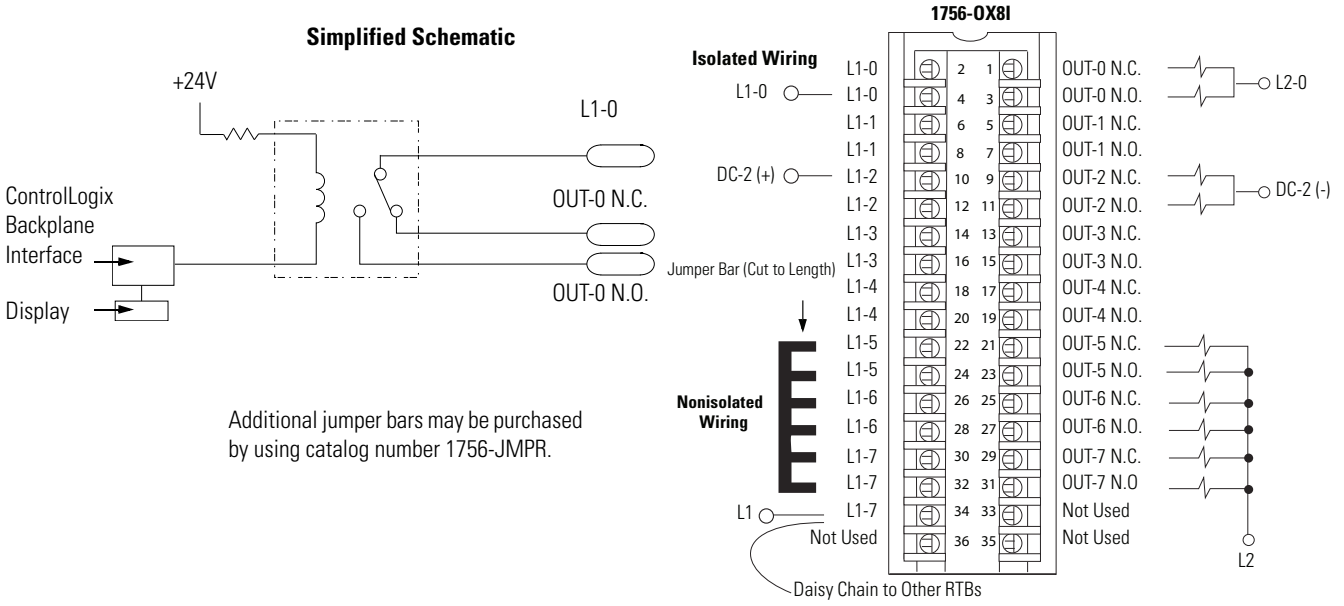
Certifications - 1756-OW16I

Certification[1]	1756-OW16I
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

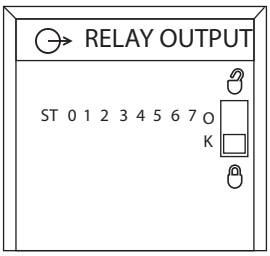
(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

1756-OX8I

ControlLogix AC (10...240V) DC (5...125V) isolated contact module



Additional jumper bars may be purchased by using catalog number 1756-JMPR.



Technical Specifications - 1756-OX8I

Attribute	1756-OX8I
Outputs	8 N.O. 8 N.C. individually isolated (2 points/group)
UL module rating	UL C300 R150
Operating voltage range	5...125V DC 10...240V AC @ 47…63 Hz
Contact current rating	2 A @ 5…30V DC 0.5 A @ 48V DC 0.25 A @ 125V DC 2 A @ 125/240V AC
Output delay time OFF to ON ON to OFF	 13 ms max 13 ms max
Current draw @ 5.1V	100 mA
Current draw @ 24V	100 mA
Power dissipation, max	3.1 W @ 60 °C (140 °F)
Thermal dissipation, max	10.57 BTU/hr
Off-state leakage current per point, max	0 mA
Initial contact resistance, max	100 mΩ @ 6V 1 A
Switching frequency, max	1 operation/3 s (0.3 Hz at rated load)
Bounce time, mean	1.2 ms
Expected contact life	300 K cycles resistive 100 K cycles inductive

Technical Specifications - 1756-OX8I

Attribute	1756-OX8I
Isolation voltage	250V (continuous), basic insulation type, outputs-to-backplane, and output-to-output Routine tested @ 1350V AC for 2 s
Removable terminal block	1756-TBCH 1756-TBS6H
Slot width	1
Wire size	0.33... 2.1 mm^2 (22...14 AWG) solid or stranded copper wire rated at 90 °C (194 °F), or greater, 1.2 mm (3/64 in.) insulation max(1)
Wire category	1(2)
North American temperature code	T4A
Enclosure type	None (open-style)

(1) Maximum wire size requires extended housing, catalog number 1756-TBE.

(2) Use this conductor category information for planning conductor routing as described in the system-level installation manual. See the Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1.

Environmental Specifications - 1756-OX8I

Attribute	1756-OX8I
Temperature, operating IEC 60068-2-1 (Test Ad, Operating Cold), IEC 60068-2-2 (Test Bd, Operating Dry Heat), IEC 60068-2-14 (Test Nb, Operating Thermal Shock)	0…60 °C (32…140 °F)
Temperature, surrounding air	60 °C (140 °F)
Temperature, storage IEC 60068-2-1 (Test Ab, Unpackaged Nonoperating Cold), IEC 60068-2-2 (Test Bb, Unpackaged Nonoperating Dry Heat), IEC 60068-2-14 (Test Na, Unpackaged Nonoperating Thermal Shock)	-40…85 °C (-40…185 °F)
Relative humidity IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat)	5…95% noncondensing
Vibration IEC 60068-2-6 (Test Fc, Operating)	2 g @ 10…500 Hz
Shock, operating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	30 g
Shock, nonoperating IEC 60068-2-27 (Test Ea, Unpackaged Shock)	50 g
Emissions	CISPR 11: Group 1, Class A
ESD immunity IEC 61000-4-2	6 kV contact discharges 8 kV air discharges
Radiated RF immunity IEC 61000-4-3	10V/m with 1 kHz sine-wave 80% AM from 80... 2000 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 900 MHz 10V/m with 200 Hz 50% Pulse 100% AM @ 1890 MHz 3V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity IEC 61000-4-4	±4 kV at 5 kHz on signal ports
Surge transient immunity IEC 61000-4-5	±1 kV line-line (DM) and ±2 kV line-earth (CM) on signal ports
Conducted RF immunity IEC 61000-4-6	10V rms with 1 kHz sine-wave 80% AM from 150 kHz...80 MHz
Oscillatory surge withstand IEEE C37.90.1	3 kV

Certifications - 1756-OX8I

Certification[1]	1756-OX8I
UL	UL Listed Industrial Control Equipment, certified for US and Canada. See UL File E65584.
CSA	CSA Certified Process Control Equipment. See CSA File LR54689C. CSA Certified Process Control Equipment for Class I, Division 2 Group A,B,C,D Hazardous Locations. See CSA File LR69960C.
CE	European Union 2004/108/IEC EMC Directive, compliant with: • EN 61326-1; Meas./Control/Lab., Industrial Requirements • EN 61000-6-2; Industrial Immunity • EN 61000-6-4; Industrial Emissions • EN 61131-2; Programmable Controllers (Clause 8, Zone A & B) European Union 2006/95/EC LVD, compliant with: • EN 61131-2; Programmable Controllers
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions
FM	FM Approved Equipment for use in Class I Division 2 Group A,B,C,D Hazardous Locations
TÜV	TÜV Certified for Functional Safety: Capable of SIL 2

(1) When marked. See the Product Certification link at http://www.ab.com for Declarations of Conformity, Certificates, and other certification details.

Notes:

Troubleshoot Your Module

Introduction

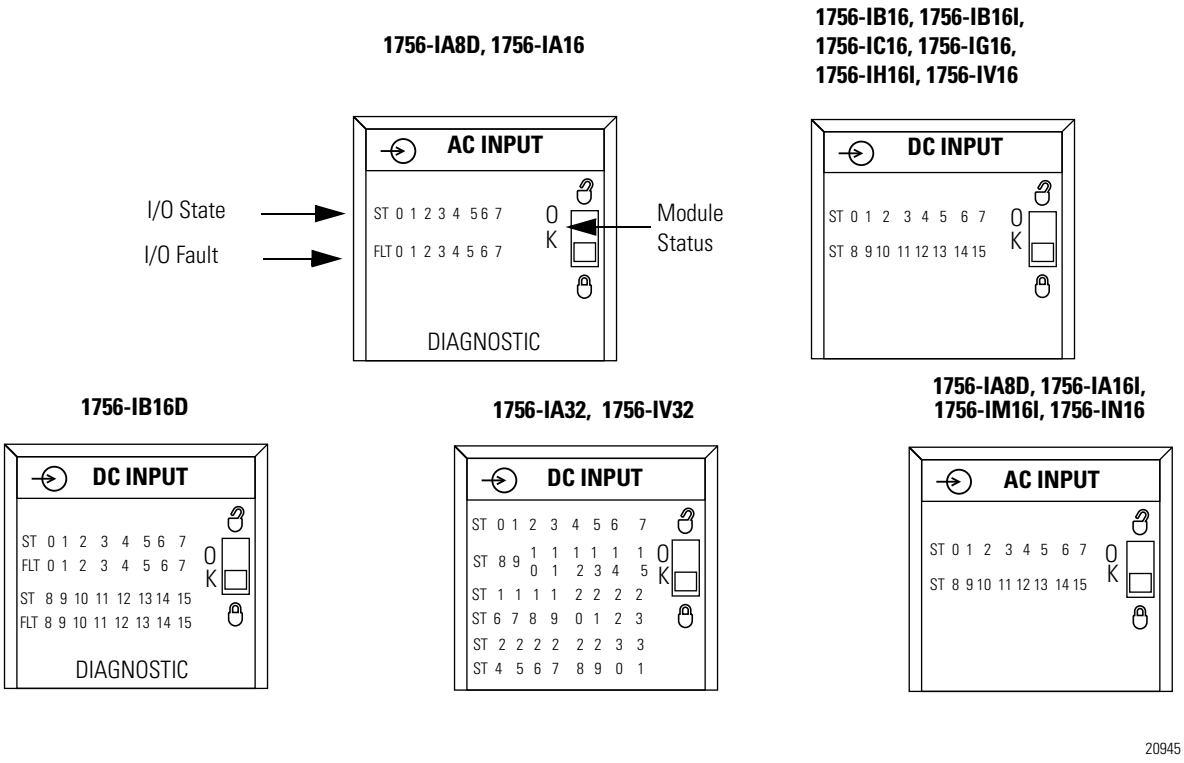
This appendix describes the status indicators on the ControlLogix digital modules and how to use them to troubleshoot the module. Each I/O module has status indicators located on the front of the module.

These indicators show the I/O state (yellow), fault, or fuse status (red). A bi-colored status indicates a module status with an 'OK' (red/green).

Status Indicators for Input Modules

Indicator	Status	Description
OK	Green light	The inputs are being multicast and in normal operating state.
OK	Flashing green	The module has passed internal diagnostics but is not multicasting inputs or it is inhibited. Uninhibit connection or establish connection to enable communication to the module.
OK	Flashing red	Previously established communication has timed out. Check the controller and chassis communication.
OK	Red light	The module must be replaced. Replace the module.
I/O State	Yellow	The input is active.
I/O State	Red	A fault has occurred for this point. Check this point at the controller.

The status indicators shown are used on input modules.

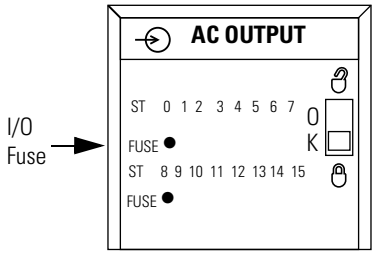


Status Indicators for Output Modules

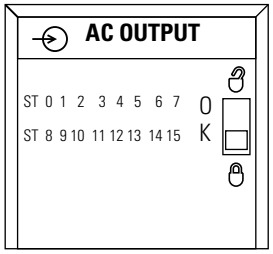
Indicator	Status	Description
OK	Steady green	The outputs are actively being controlled by a system processor.
OK	Flashing green	The module has passed internal diagnostics but is not actively controlled or it is inhibited or controller is in Program mode. Uninhibit connection, establish connection or transition controller to Run mode to enable communication to module.
OK	Flashing red	Previously established communication has timed out. Check the controller and chassis communication.
OK	Steady red	The module must be replaced. Replace the module.
I/O State	Yellow	The output is active.
I/O Fuse	Red	A short overload fault has occurred for a point in this group. Check the wiring for a short-overload. Also check the Module Properties dialog box in RSLogix 5000 software and reset the fuse.
I/O Fault	Red	A fault has occurred for this point. Check this point at the controller.

The status indicators shown are used on output modules.

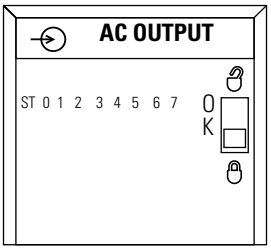
1756-OA16



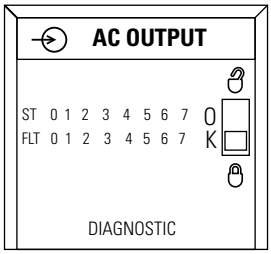
1756-OA16I



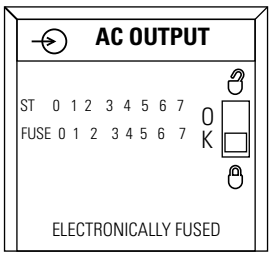
1756-OA8, 1756-ON8



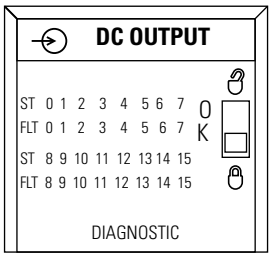
1756-OA8D



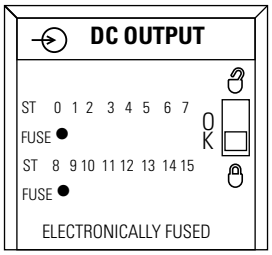
1756-OA8E



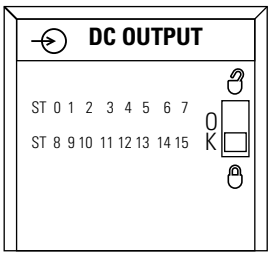
1756-OB16D



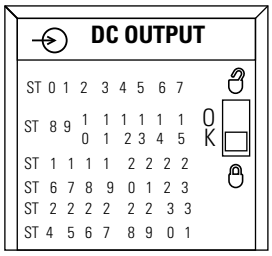
1756-OB16E, 1756-OV16E



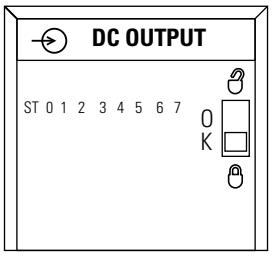
1756-OB16I, 1756-OB16IS, 1756-OG16



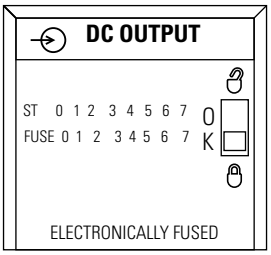
1756-OB32, 1756-OV32E



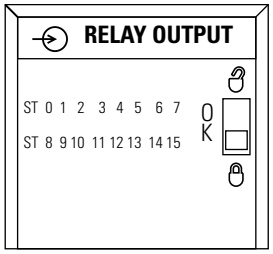
1756-OB8I, 1756-OB8I, 1756-OC8, 1756-OH8I



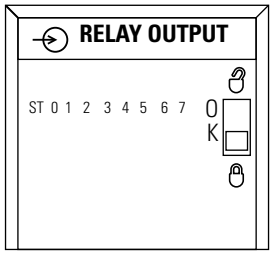
1756-OB8EI



1756-OW16I



1756-OX8I



40464

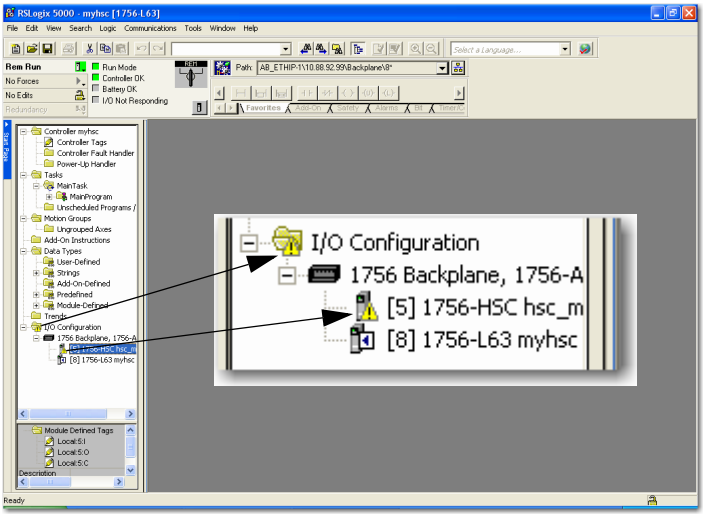
Use RSLogix 5000 software for Troubleshooting

In addition to the status indicator display on the module, RSLogix 5000 software will alert you to fault conditions. Fault conditions are reported in one of three ways.

- Warning signal on the main screen next to the module - This occurs when the connection to the module is broken.
- Message in a screen's status line.
- Notification in the Tag Editor - General module faults are also reported in the Tag Editor. Diagnostic faults are reported only in the Tag Editor.
- Status on the Module Info tab.

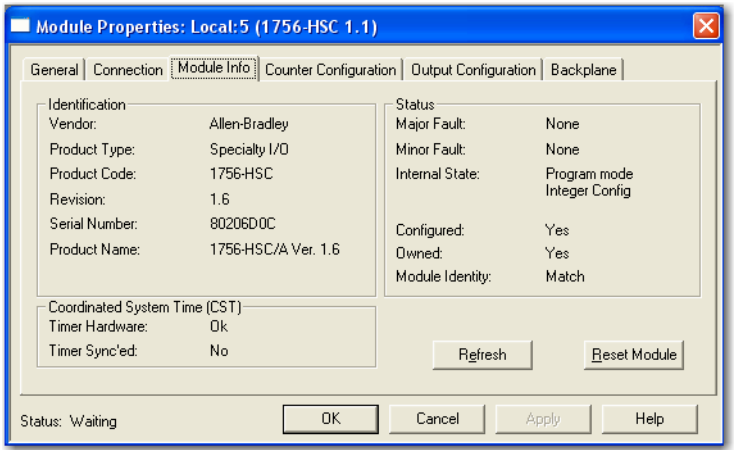
The following windows display fault notification in RSLogix 5000 software.

Warning Signal on Main Screen



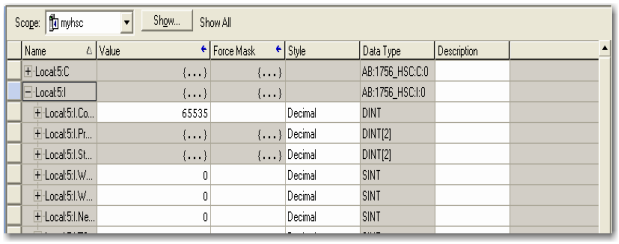
A warning icon appears in the I/O Configuration tree when a communication fault occurs.

Fault Message in Status Line



On the Module Info tab, in the Status section, the Major and Minor Faults are listed along with the Internal State of the module.

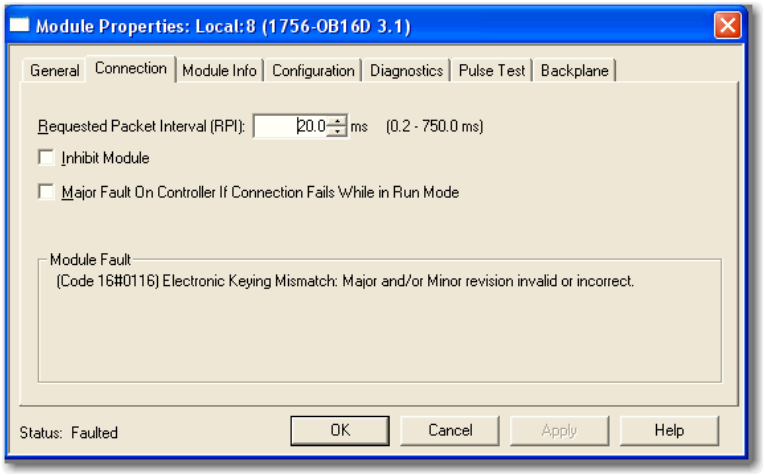
Notification in Tag Editor



The Value field shows 65535 to indicate the module connection has been broken.

Fault Type Determination

When you are monitoring a module's configuration properties in RSLogix 5000 software and receive a Communication fault message, the Connection tab lists the type of fault under Module Fault.



Tag Definitions

Introduction

This appendix describes the tags that are used for standard and diagnostic input and output modules.

Module-defined data types and tags are created when a module is initiated. The set of tags associated with any module depends on the type of module and the communication format chosen during configuration.

Standard and Diagnostic Input Module Tags

ControlLogix standard and diagnostic input modules have two types of tags.

- **Configuration** - structure of data sent from the controller to the I/O module upon powerup.
- **Input** - structure of data continually sent from the I/O module to the controller containing the current, operational status of the module.

IMPORTANT The table lists all possible standard input module tags. In each application, the series of tags varies, depending on how the module is configured.

Standard Input Module Configuration Tags

Name	Configuration or I/O Data	Definition
COSOnOffEn (1bit per point)	Configuration	**Change of State On to Off** – Causes updated data to be sent to the Controller immediately after an input for an On to Off transition of the masked input points. The CST timestamp also is updated. May be used to trigger an Event Task in the Controller. 0 = Disable. 1 = Enable.

Standard Input Module Configuration Tags

Name	Configuration or I/O Data	Definition
COS OffOnEn (1 bit per point)	Configuration	**Change of State Off to On** – Causes updated data to be sent to the Controller immediately after an input for an Off to On transition of the masked input points. The CST timestamp also is updated. May be used to trigger an Event Task in the Controller. 0 = Disable. 1 = Enable.
FilterOnOff_0_7… (1 byte per group)	Configuration	**Filter Times On to Off** – Filter time for digital filter in digital input modules for On to Off transition. Operates on groups of eight points. Valid DC filter times=0, 1, 2, 9, 18 ms. Valid AC filter times=1, 2 ms.
FilterOffOn_0_7… (1 byte per group)	Configuration	**Filter Times Off to On** – Filter time for digital filter in digital input modules for Off to On transition. Operates on groups of eight points. Valid DC filter times=0, 1, 2 ms. Valid AC filter times=1, 2 ms.

Standard Input Data Tags

Name	Configuration or I/O Data	Definition
CSTTimestamp (8 bytes)	Input data	**Coordinated System Time Timestamp** – Timestamp can be configured to indicate the time that data changed (see COSOffOnEn, COSOnOffEn, COSStatus, DiagCOSDisable) and/or the time that a diagnostic fault occurred (see OpenWireEn, Field PwrLossEn).
Data (1 bit per point)	Input data	**Off/On** - Status for each input point. 0 = Off. 1 = On.
Fault (1 bit per point)	Input data	**Fault Status** - An an ordered status of faults that indicates a point is faulted and input data for that point may be incorrect. Check other diagnostic faults, if they are available, for further diagnosis of the root cause. If communication to the input module is lost, then all points for the module will be faulted. 0 = No fault. 1 = Fault (OpenWire or FieldPwrLoss or Comm Fault).

Diagnostic Input Module Configuration Tags

Name	Configuration or I/O Data	Definition
COSOnOffEn (1bit per point)	Configuration	**Change of State On to Off** – Triggers an event in the controller for On to Off transition of input point and causes the input module to update the data table as soon as possible. The CST timestamp is also updated. 0 = Disable. 1 = Enable.
COS OffOnEn (1 bit per point)	Configuration	**Change of State Off to On** – Triggers an event in the controller for Off to On transition of input point and causes the input module to update the data table as soon as possible. The CST timestamp is also updated. 0 = Disable. 1 = Enable.

Diagnostic Input Module Configuration Tags

Name	Configuration or I/O Data	Definition
DiagCOSDisable (1 bit per point)	Configuration	**Diagnostic Change of State** – Triggers the module to transmit diagnostic status data with an updated timestamp as soon as the diagnostic data changes state.
FaultLatchEn (1 bit per point)	Configuration	**Fault is Latched** – If enabled for a point, any OpenWire or FieldPwrLoss stays latched in the faulted state even if the fault no longer exists until you clear the fault. 0 = Disable. 1 = Enable latching.
FieldPwrLossEn (1 bit per point)	Configuration	**Field Power Loss** - Enables Field Power Loss diagnostic. 0 = Disable. 1 = Enable.
FilterOnOff_0_7… (1 byte per group)	Configuration	**Filter Times On to Off** - Filter time for digital filter in digital input modules for On to Off transition. Operates on groups of eight points. Valid DC filter times=0, 1, 2, 9, 18 ms. Valid AC filter times=1, 2 ms.
FilterOffOn_0_7… (1 byte per group)	Configuration	**Filter Times Off to On** – Filter time for digital filter in digital input modules for Off to On transition. Operates on groups of eight points. Valid DC filter times=0, 1, 2 ms. Valid AC filter times=1, 2 ms.
OpenWireEn (1 bit per point)	Configuration	**Open Wire** - Enables Open Wire diagnostic. 0 = Disable. 1 = Enable.

Diagnostic Input Data Tags

Name	Configuration or I/O Data	Definition
CSTTimestamp (8 bytes)	Input data	**Coordinated System Time Timestamp** – Timestamp can be configured to indicate the time that data changed (see COSOffOnEn, COSOnOffEn, COSStatus, DiagCOSDisable) and/or the time that a diagnostic fault occurred (see OpenWireEn, Field PwrLossEn).
Data (1 bit per point)	Input data	**Off/On** - Status for each input point. 0 = Off. 1 = On.

Diagnostic Input Data Tags

Name	Configuration or I/O Data	Definition
Fault (1 bit per point)	Input data	**Fault Status** - An ordered status of faults that indicates a point is faulted and input data for that point may be incorrect. Check other diagnostic faults, if they are available, for further diagnosis of the root cause. If communication to the input module is lost or inhibited, then all points for the module will be faulted by the processor. 0 = No fault. 1 = Fault (OpenWire or FieldPwrLoss or Comm Fault).
FieldPwrLoss (1 bit per point)	Input data	**Field Power Loss** - AC input diagnostic detects that field power has failed or is disconnected from the module. Open Wire also is detected. 0 = No fault. 1 = Fault.
OpenWire (1 bit per point)	Input data	**Open Wire** - Diagnostic that detects that a wire has been disconnected from the input point. If a group of points shows this fault, then possible the return (L1 or GND) is missing from the module. Also see FieldPwrLoss. 0 = No fault. 1 = Fault.

Standard and Diagnostic Output Module Tags

ControlLogix standard and diagnostic digital output modules have three types of tags.

- **Configuration** - structure of data sent from the controller to the I/O module upon powerup.
- **Input** - structure of data continually sent from the I/O module to the controller containing the current, operational status of the module.
- **Output** - structure of data continually sent from the controller to the I/O module that can modify the module behavior.

IMPORTANT The table lists all possible standard output module tags. In each application, the series of tags varies, depending on how the module is configured.

Standard Output Module Configuration Tags

Name	Configuration or I/O Data	Definition
FaultMode (1bit per point)	Configuration	**Fault Mode** – Used in conjunction with FaultValue to configure the state of outputs when a communications fault occurs. See FaultValue. 0 = Use FaultValue (Off or On). 1 = Hold Last State.
FaultValue (1 bit per point)	Configuration	**Fault Value** – Used in conjunction with FaultMode to configure the state of outputs when a communications fault occurs. See FaultMode. 0 = Off. 1 = On.
ProgMode (1 bit per point)	Configuration	**Program Mode** – Used in conjunction with ProgValue to configure the state of outputs when the controller is in Program mode. See ProgValue. 0 = Use ProgValue (Off or On). 1 = Hold Last State.
ProgValue (1 bit per point)	Configuration	**Program Value** – Used in conjunction with ProgMode to configure the state of outputs when the controller is in Program mode. See ProgMode. 0 = Off. 1 = On.
ProgToFaultEn (1 byte per module)	Configuration	**Program to Fault Transition** – Diagnostic enables the transition of outputs to FaultMode if a communications failure occurs in Program mode. Otherwise outputs will remain in Program mode. See ProgMode, ProgValue, FaultMode, FaultValue. 0 = Outputs stay in Program mode if comm failure. 1 = Outputs go to FaultMode if comm failure.

Standard Output Module Input Data Tags

Name	Configuration or I/O Data	Definition
CSTTimestamp (8 bytes)	Input data	**Coordinated System Time Timestamp** – Timestamp of diagnostic input data including fusing (see BlownFuse, NoLoad, OutputVerifyFault, FieldPwrLoss), which is updated whenever a diagnostic fault occurs or goes away.
Data (1 bit per point)	Input data	**Data** – Off/On status for the output point ECHOED back from the output module. This is used to verify proper communication only. No field side verification is done. For field side verification, see OutputVerifyFault. 0 = Off. 1 = On.
Fault (1 bit per point)	Input data	This is an ordered status of faults that indicates a point is faulted and I/O data for that point may be incorrect. Check other diagnostic faults, if they are available, for further diagnosis of the root cause. If communication to the input module is lost, then all points for the module will be faulted. 0 = No fault. 1 = Fault (FuseBlown, NoLoad, OutputVerifyFault, FieldPwrLoss, or CommFault).
FuseBlown (1 bit per point)	Input data	**Fuse is Blown** – An electronic or mechanical fuse has detected a short or overload condition for an output point. All FuseBlown conditions are latched and must be reset by the user. 0 = No fault. 1 = Fault.

Standard Output Module Output Data Tags

Name	Configuration or I/O Data	Definition
CSTTimestamp (8 bytes)	Output data	**Coordinated System Time Timestamp** – Timestamp to be used with scheduled outputs and coordinated system time (CST). Used to synchronize outputs across the system by indicating the time (CST timestamp) at which the output module is to apply its outputs.
Data (1 bit per point)	Output data	**Off/On** - Status for the output point originating from the controller. 0 = Off. 1 = On.

Diagnostic Output Module Configuration Tags

Name	Configuration or I/O Data	Definition
FaultLatchEn (1bit per point)	Configuration	**Fault is Latched** - If enabled for a point, any NoLoad, OutputVerifyFault or FieldPwrLoss stays latched in the faulted state even if the fault no longer exists until the user clears the fault. This does not affect FuseBlown; it is always latched. 0 = Disable. 1 = Enable latching.
FaultMode (1bit per point)	Configuration	**Fault Mode** – Used in conjunction with FaultValue to configure the state of outputs when a communications fault occurs. See FaultValue. 0 = Use FaultValue (Off or On). 1 = Hold Last State.
FaultValue (1 bit per point)	Configuration	**Fault Value** – Used in conjunction with FaultMode to configure the state of outputs when a communications fault occurs. See FaultMode. 0 = Off. 1 = On.
FieldPwrLoss (1 bit per point)	Configuration	**Field Power Loss** - Enables Field Power Loss diagnostic. 0 = Disable. 1 = Enable.
NoLoadEn (1 bit per point)	Configuration	**No Load** - Enables No Load diagnostic. 0 = Disable. 1 = Enable.
OutputVerifyEn (1 bit per point)	Configuration	**Output Verify** - Enables Output Verify diagnostic. 0 = Disable. 1 = Enable.
ProgMode (1 bit per point)	Configuration	**Program Mode** – Used in conjnunction with ProgValue to configure the state of outputs when the controller is in Program mode. See ProgValue. 0 = Use ProgValue (Off or On). 1 = Hold Last State.
ProgValue (1 bit per point)	Configuration	**Program Value** – Used in conjunction with ProgMode to configure the state of outputs when the controller is in Program mode. See ProgMode. 0 = Off. 1 = On.
ProgToFaultEn (1 byte per module)	Configuration	**Program to Fault Transition** – Diagnostic enables the transition of outputs to FaultMode if a communication failure occurs in Program mode. Otherwise outputs will remain in Program mode. See ProgMode, ProgValue, FaultMode, FaultValue. 0 = Outputs stay in Program mode if comm failure. 1 = Outputs go to FaultMode if comm failure.

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Diagnostic Output Module Input Data Tags

Name	Configuration or I/O Data	Definition
CSTTimestamp (8 bytes)	Input data	**Coordinated System Time Timestamp** – Timestamp of diagnostic input data including fusing (see BlownFuse, NoLoad, OutputVerifyFault, FieldPwrLoss), which is updated whenever a diagnostic fault occurs or goes away.
Data (1 bit per point)	Input data	**Data** – Off/On status for the output point ECHOED back from the output module. This is used to verify proper communication only. No field side verification is done. For field side verification, see OutputVerifyFault. 0 = Off. 1 = On.
Fault (1 bit per point)	Input data	**Fault Status** - An ordered status of faults that indicates a point is faulted and I/O data for that point may be incorrect. Check other diagnostic faults, if they are available, for further diagnosis of the root cause. If communication to the input module is lost or inhibited, then all points for the module will be faulted by the processor. 0 = No fault. 1 = Fault (FuseBlown, NoLoad, OutputVerifyFault, FieldPwrLoss, or CommFault).
FieldPwrLoss (1 bit per point)	Input data	**Field Power Loss** – AC output diagnostic detects that field power has failed or is disconnected from the module. No Load also is detected. 0 = No fault. 1 = Fault.
FuseBlown (1 bit per point)	Input data	**Fuse is Blown** - An electronic or mechanical fuse has detected a short-circuit condition for an output point. All FuseBlown conditions are latched and must be reset by the user. 0 = No fault 1 = Fault.
NoLoad (1 bit per group)	Input data	**No Load** - Diagnostic that indicates the absence of a load (such as, the wire is disconnected from the module). This diagnostic operates only in the Off state. 0 = No fault. 1 = Fault.
OutputVerifyFault (1 bit per point)	Input data	**Output Verify** - Diagnostic that indicates that the input has been commanded to the On state but the output has not been verified to be On. 0 = No fault 1 = Fault (output is not On).

Diagnostic Output Module Output Data Tags

Name	Configuration or I/O Data	Definition
CSTTimestamp (8 bytes)	Output data	**Coordinated System Time Timestamp** – Timestamp to be used with scheduled outputs and coordinated system time (CST). Used to synchronize outputs across the system by indicatin the time (CST timestamp) at which the output module is to apply its outputs.
Data (1 bit per point)	Output data	**Off/On** - Status for the output point originating from the controller. 0 = Off. 1 = On.

Notes:

Use Ladder Logic To Perform Run Time Services and Reconfiguration

Introduction

You can use ladder logic to perform run time services on your module. For example, page 91 shows how to reset an electronic fuse on the 1756-OB16D module by using RSLogix 5000 software. This appendix provides an example of how to reset the same fuse without using RSLogix 5000 software.

In addition to performing run time services, you can use ladder logic to change configuration. Chapter 6 explained how to use the RSLogix 5000 software to set configuration parameters in your ControlLogix digital I/O module. Some of those parameters may also be changed through ladder logic.

Using Message Instructions

In ladder logic, you can use Message instructions to send occasional services to any ControlLogix I/O module. Message instructions send an explicit service to the module, causing specific behavior to occur. For example, unlatching a high alarm can be performed by a message instruction.

Message instructions maintain the following characteristics:

- Messages use unscheduled portions of system communication bandwidth
- One service is performed per instruction
- Performing module services does not impede module functionality, such as sampling inputs or applying new outputs

Processing Real-time Control and Module Services

Services sent through message instructions are not as time critical as the module behavior defined during configuration and maintained by a real-time connection. Therefore, the module processes messaging services only after the needs of the I/O connection have been met.

For example, you may want to unlatch all process alarms on the module, but real-time control of your process is still occurring by using the input value from that same channel. Because the input value is critical to your application, the module prioritizes the sampling of inputs ahead of the unlatch service request.

This prioritization allows input channels to be sampled at the same frequency and the process alarms to be unlatched in the time between sampling and producing the real-time input data.

One Service Performed Per Instruction

Message instructions will only cause a module service to be performed once per execution. For example, if a message instruction sends a service to the module to unlatch the high high alarm on a particular channel, that channel's high high alarm will unlatch, but may be set on a subsequent channel sample. The message instruction must then be re-executed to unlatch the alarm a second time.

Create a New Tag

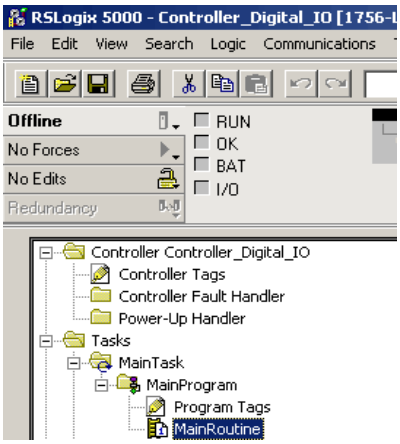
This section shows how to create a tag in ladder logic when adding a message instruction. Ladder logic is written in the Main Routine section of the RSLogix 5000 software program.

Follow these steps to create a tag.

1. Start the RSLogix 5000 software program and open an existing I/O project or create a new one.

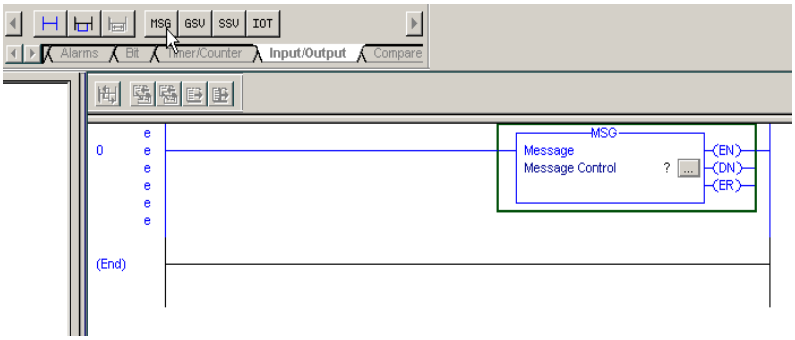
2. On the Controller Organizer, double-click MainRoutine.

   Expand MainProgram to see Main Routine as a sub-menu item.



A graphic that looks like a ladder, with rungs, appears in the right side of the RSLogix 5000 software program. You attach run-time service, such as a message instruction, to the rungs and then download the information to a controller.

You can tell that the rung is in Edit mode because of the 'e' at the left side of the rung.

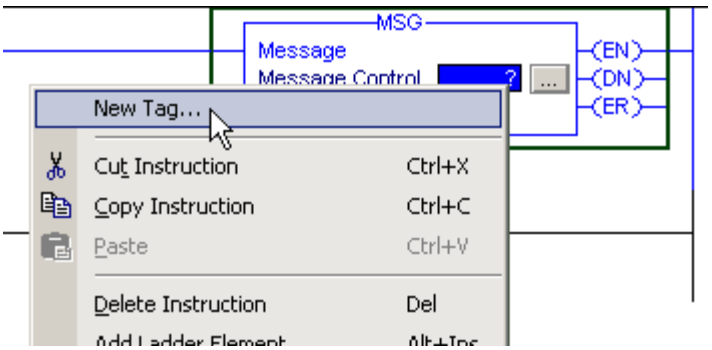


3. Find, then click MSG (message) instruction on the instruction toolbar.

   The MSG icon is among the formats on the Input/Output tab of the instruction toolbar.

   You also can drag-and-drop an instruction icon onto a rung. A green dot appears when a valid location is detected for the instruction on the rung.

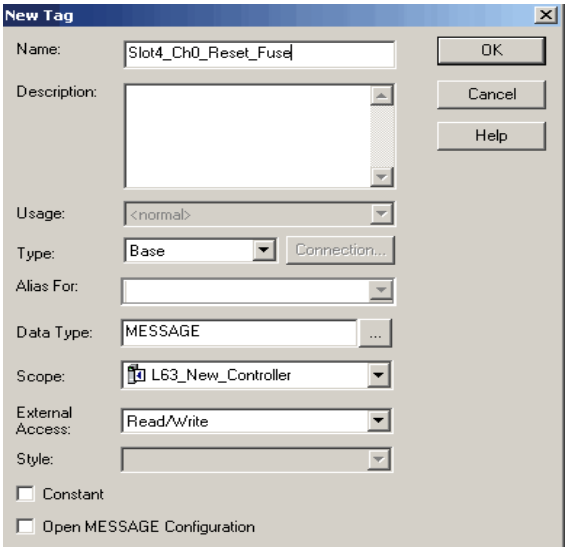
4. Inside the message box (in the Message Control field), right-click the question mark to access a pull-down menu.



5. Choose New Tag.

The New Tag dialog box appears with the cursor in the Name field.

IMPORTANT We suggest you name the tag to indicate what module service the message instruction is sending. For example, if a message instruction is to reset an electronic fuse, then name the tag, 'reset fuse', to reflect this.



6. Choose from the options in the New Tag dialog box.

Field Name	Description
Name	Type the tag name, including the slot number in the module.
Description	Type an option tag description.
Usage	Use the default.
Type	Use the default.
Alias for	Leave blank.
Data Type	Choose MESSAGE.
Scope	Choose the Controller scope. **Note:** Message tags can be created only with the Controller scope.
External Access	Use the default.

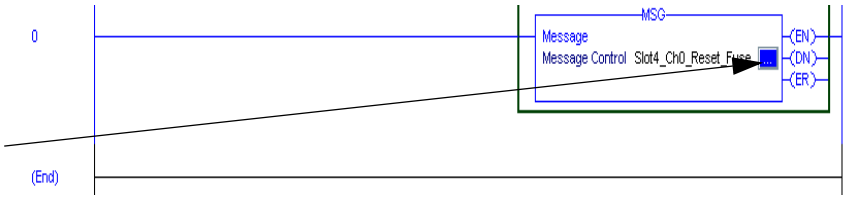
Field Name	Description
Style	Leave blank.
Constant	Leave blank.
Open MESSAGE Configuration	Leave the box blank if you do NOT want to automatically access the Message Configuration screen when OK is clicked. You still can access the Message Configuration screen later by following the procedures on page 264.

7. Click OK.

Enter Message Configuration

After creating a tag, you must enter certain parameters for the message configuration. This information is entered on the Configuration and Communication tabs of the Message Configuration dialog box.

The Message Configuration dialog box is accessed by clicking the box with the ellipses (in the Message Control field).



IMPORTANT

In RSLogix 5000 software, version 10 and later, the Message Configuration dialog boxes changed significantly to make it easier for you to configure your messages.

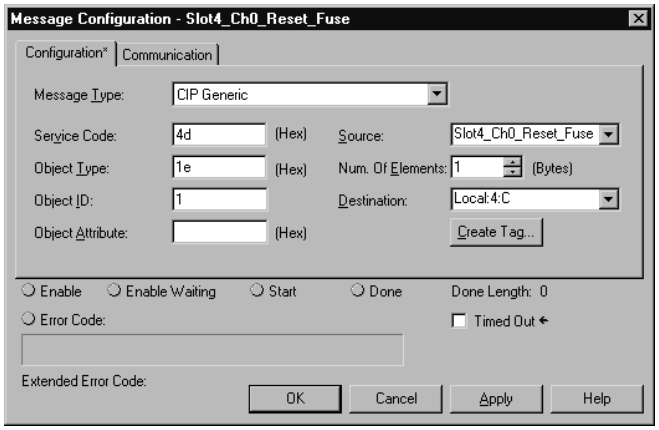
- For example, in **version 9 and earlier**, depending on the Message Type, you are required to configure some combination of the following:
  - Service Code
  - Object Type
  - Object ID
  - Object Attribute
  - Source
  - Number of Elements
  - Destination
- In **version 10 and later**, after you choose a Service Type, RSLogix 5000 software fills in most of the fields listed above. The fields you must fill in are dependent on what Service Type you choose. For example, with the Reset Electronic Fuse service, you must know only the Source Element and the Destination.

The following section shows how to configure messages with RSLogix 5000 software, version 10 and later. A table describes the relationship of the fields in both dialog boxes so you can configure messages by using RSLogix 5000 software version 9 and earlier.

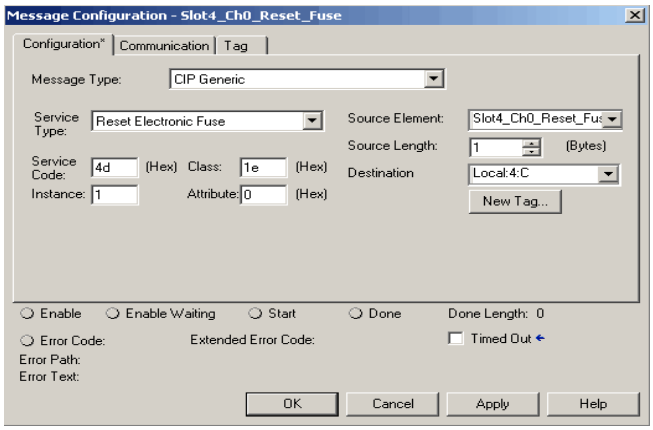
Configuration Tab

The Configuration tab provides information on what module service to perform and where to perform it.

RSLogix 5000 Software, Version 9 and Earlier



RSLogix 5000 Software, Version 10 and Later



The following table explains the relationship of the fields in the above dialog boxes. For example, despite different entry fields, both screen examples are configured to send a message to reset an electronic fuse (module service) on Channel 0 of a 1756-OA8D module (where to perform the service).

Relationship of Message Configuration Parameters

RSLogix 5000 Versions 9 and earlier	RSLogix 5000 Versions 10 and later	Description
Service Code	Service Type	Defines the type of module service to be performed. For example, a reset. **Note:** In versions 10 and later, you can use a pull-down menu to choose the Service Type. RSLogix 5000 software defaults the Service Code, Instance, Class, and Attribute parameters based on the Service Type that you choose. All values are in Hex.
Object Type	Class	Object that you are sending a message to, such as the device object or a discrete output point.
Object ID	Instance	Each object can have multiple instances. For example, a discrete output can have 16 points or instances of where a message can be sent. This specifies the instance.
Object Attribute	Attribute	Further identifies the exact address for the message. An analog input can have multiple alarms so this attribute acknowledges a specific alarm and not the other alarms. If an attribute is not specified (default to 0) the Service applies to all attributes of the Class/Instance.

The following table contains code information that is **necessary only** if you are configuring the message with RSLogix 5000 software, **versions 9 or earlier**.

Module Services and Configuration Information - Required for RSLogix 5000 Software, Versions 9 and Earlier

	Retrieve CST Information	Retrieve Device Information (WHO)	Reset the Module	Reset Latched Diagnostics	Reset Electronic Fuse	Pulse Test
Service Code	1	1	5	4b	4d	4c
Object Type	77	1	1	1d = Input modules 1e = Output modules	1e	1e
Object ID	1	1	1	1	1	1
Object Attribute	N/A	N/A	N/A	N/A	N/A	N/A
Source	N/A	N/A	N/A	Enable_32_Points DINT	Enable_32_Points DINT	Pulse_Test_Parameters SINT[10]
Number of Elements (bytes)	0	0	0	4	4	10
Destination	CST_Information SINT [20]	WHO_Information SINT [48]	N/A	N/A	Results_32_Points DINT	N/A
Modules	All	All	All	1756-OA8D, 1756-OB16D, 1756-OA8E, 1756-IA8D, 1756-IB16D	1756-OA8D, 1756-OB16D	1756-OA8D, 1756-OB16D

When you are using RSLogix 5000 software, **versions 9 and earlier**, some services require multiple parameters and tags in the Source and Destination fields. An example is Pulse Test.

These services use copy instructions to move multiple tags to and from the message instruction source and destination tags. The following table lists the copy instruction parameters needed for these services.

Copy Instruction Parameters for Module Services - Required for RSLogix 5000 Software, Versions 9 and Earlier

Source/Destination Tag in MSG Instruction	Description	Copy Instruction (COP) - This instruction moves data to/from generic source/destination buffers		
		Source	Destination	Length (bytes)
Pulse_Test_Parameters SINT[10]	Determines which point to perform the pulse test on. Each bit corresponds to a point. Only test one point at a time.	Enable_32_points DINT	Pulse_Test_Parameters [0]	4
	Determines maximum pulse width of the pulse test in milliseconds. Pulse test inverts state of the output up to the maximum specified time. Units are in 100 µs increments. Default tag value = 2 ms (that is, 20).	Pulse_Width INT	Pulse_Test_Parameters [4]	2
	For AC modules only, this specifies how long to delay after the zero cross before performing the pulse test. Optimum time to perform pulse test is at its peak AC voltage. Units are in 100 µs increments. Default tag value = 4 ms (that is, 40).	Zero_Cross_Delay INT	Pulse_Test_Parameters [6]	2
	Specifies how long to wait after the pulse is completed before declaring a fault. Output verify delay parameter is needed to account for the hardware propagation delay. Units are in 100 µs increments. Default tag value = 2 ms (that is, 20).	Output_Verify_Delay INT	Pulse_Test_Parameters [8]	2
CST_Information SINT[20]	Current CST Time from Module	CST_Information[0]	Current_Time DINT[2]	8
	Status of CST in Module Bit0: 0=timer OK, 1=timer fault Bit1: 0=no ramping, 1=ramping (ramping indicates that once time is synchronized, it will correct errors by slowly ramping to the master's time) Bit2: 0=not time master, 1=time master (that is, controller) Bit3: 0=time not synced, 1=time synced with master	CST_Information[8]	CST_Status INT	2
	Size of timer in bits	CST_Information[10]	CST_Timer_Size INT	2
	Unused	CST_Information[12]	CST_reserved	8

Copy Instruction Parameters for Module Services - Required for RSLogix 5000 Software, Versions 9 and Earlier

Source/Destination Tag in MSG Instruction	Description	Copy Instruction (COP) - This instruction moves data to/from generic source/destination buffers		
		Source	Destination	Length (bytes)
WHO_Information SINT[47]	Device manufacturer's vendor ID (that is, 1 = AB)	WHO_Information[0]	WHO_vendor INT	2
	Device's product type (that is, 7 = Digital I/O)	WHO_Information[2]	WHO_product_type INT	2
	Device's catalog code which maps to its catalog number	WHO_Information[4]	WHO_catalog_code INT	2
	Device's major revision	WHO_Information[6]	WHO_major_revision SINT	1
	Device's minor revision	WHO_Information[7]	WHO_minor_revision SINT	1
	Device's internal status Bit 0: 0 = unowned, 1 = owned Bit 2: 0 = unconfigured, 1 = configured Bits 7…4: forms a 4-bit number indicating Device Specific Status For Digital I/O: 0 = Self-Test 1 = Flash update in progress 2 = Communication fault 3 = Not owned 4 = Unused 5 = Internal fault (module needs to be flash updated) 6 = Run mode 7 = Program mode (N/A for input modules) Bit 8: 0 = no fault, 1 = Minor recoverable fault (that is, backplane error detected) Bit 9: 0 = no fault, 1 = Minor non-recoverable fault Bit 10: 0 = no fault, 1 = Major recoverable fault Bit 11: 0 = no fault, 1 = Major non-recoverable fault (that is, module needs to be reflashed) Bits 15…12: unused	WHO_Information[8]	WHO_status INT	2
	Device's serial number	WHO_Information[10]	WHO_serial_number DINT	4
	Number of characters in the text string	WHO_Information[14]	WHO_string_length SINT	1
	Device's ASCII text string describing the module	WHO_Information[15]	WHO_ascii_string	32

The following table lists tags used in the Source and Destination fields of the message instructions.

Source and Destination Field Tags

Source Tag	Description
Enable_32_Points DINT	Parameter used to determine which points are enabled for the service. That is, if bit 0 = 1 for Reset Fuse, then point 0 has its electronic fuse reset.
Results_32_Points DINT	Pass (0)/ Fail (1) result for the service. That is, if bit 0 = 1 for the results of the Reset Fuse, then the Reset Fuse failed for point 0.

If you are using RSLogix 5000 software, **versions 10 and later**, choose the physical location, slot number, and data type in the Source Element and Destination fields.

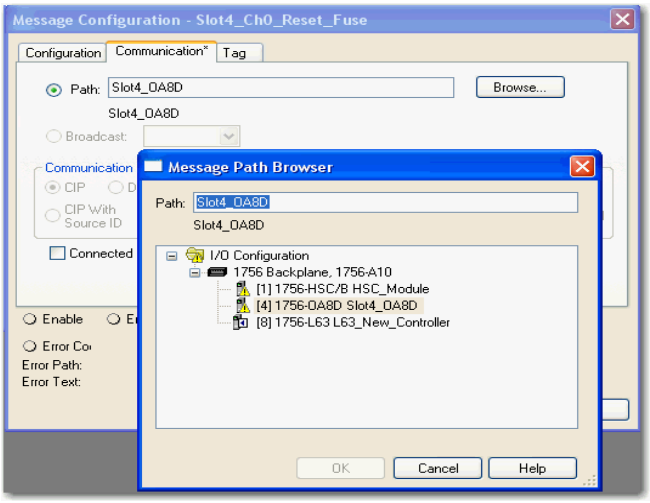
Communication Tab

The Communication tab provides information on the path of the message instruction. For example, the slot number of a 1756-OA8D module distinguishes exactly which module a message is designated for.

IMPORTANT

Use the Brown button to see a list of the I/O modules in the system. You choose a path when you choose a module from the list.

You must name an I/O module during initial module configuration to choose a path for your message instruction. Click OK to set the path.



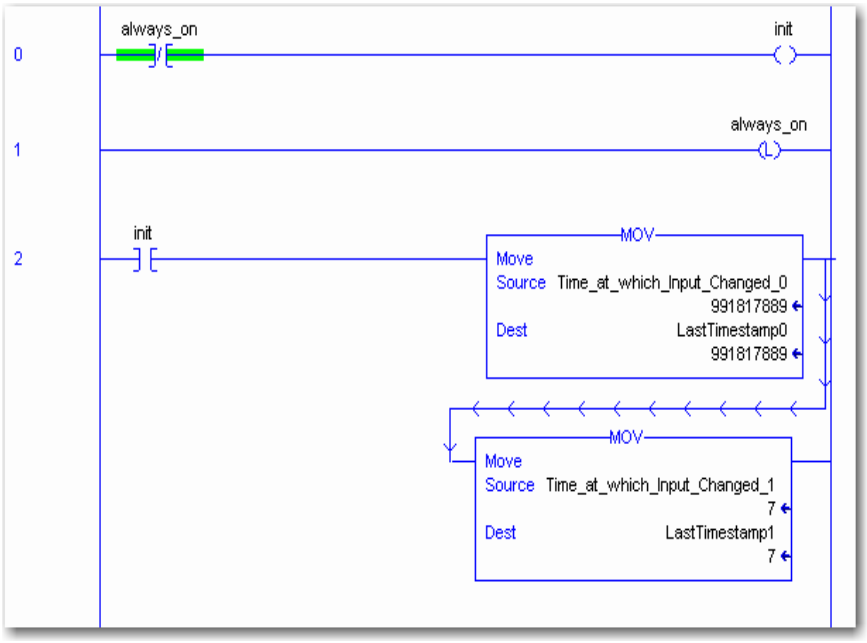
Use Timestamped Inputs and Scheduled Outputs

This section demonstrates the use of timestamped inputs and scheduled outputs for digital I/O. The change of state (CST) can be used to synchronize the output turning Off to On based upon the time that the input transitioned Off to On. The program can be extended to include synchronizing multiple output modules by sending the same timestamp to all output modules.

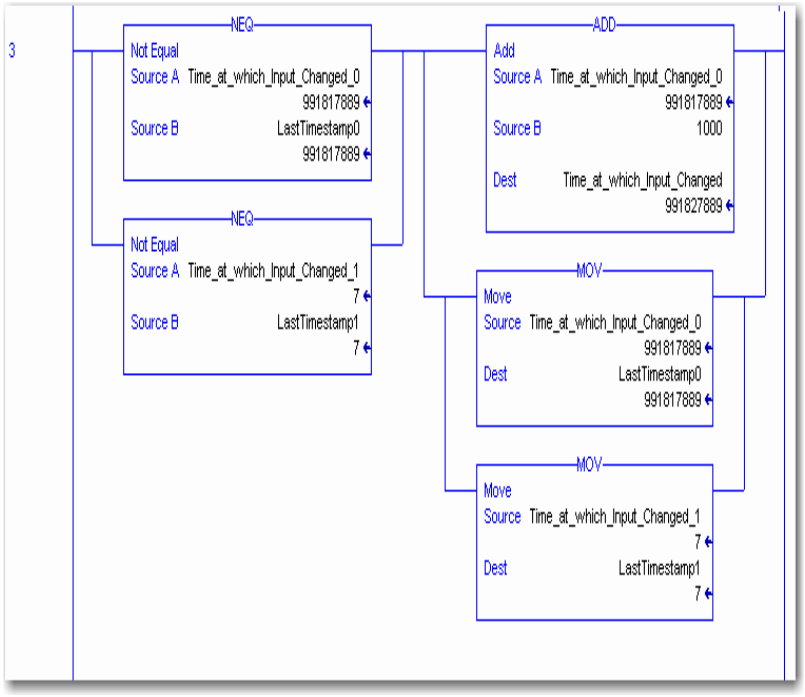
For our example, the output will follow the state of the input 0, but it will be delayed by exactly 10 ms. The advantage of using CST (over timers) is that the synchronization is being performed at the I/O module, which eliminates any jitter due to controller or communication delays.

Your control becomes much more deterministic even under changing loads. For this synchronization to work properly, the 10 ms delay must be long enough to account for any controller, backplane, and network delays. The input and output modules must reside in the same rack as a Time Master (that is, controller). Timestamp units are microseconds.

In the following illustrations, the program uses the instructions down the ladder.



- Rungs 0 and 1 are used to detect the transition from Program to Run mode. This is used to turn On 'init', which causes the program to initialize its tags.
- Rung 2 only executes once and initializes the LastTimestamp. LastTimestamp is used to detect a Change of State on the input point by checking to see if the timestamp of the input data has changed.



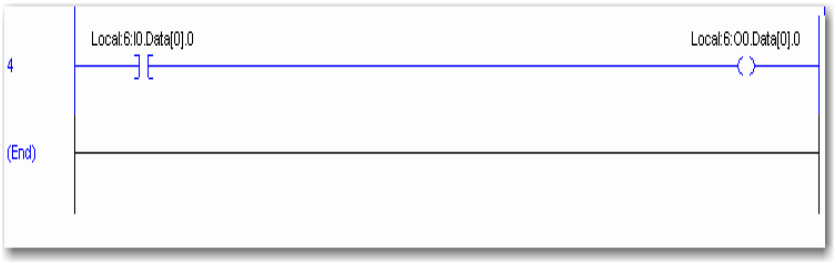
- Rung 3 is the main rung that checks for Change of State on the input point by comparing the current input timestamp (that is, Time_at_which_Input_Changed) with the last timestamp (LastTimestamp).

  The input point (point 0) must have Change of State enabled or the timestamp will not update when the point transitions (that is, Off-On). Once Change of State has been detected, 10 ms is added to the input timestamp and sent to the output module's timestamp.

  This causes the output module to apply its output exactly 10 ms (10,000 µs) after the input changed state.

  The MOVe instructions update 'LastTimestamp' in preparation for the next change of state.

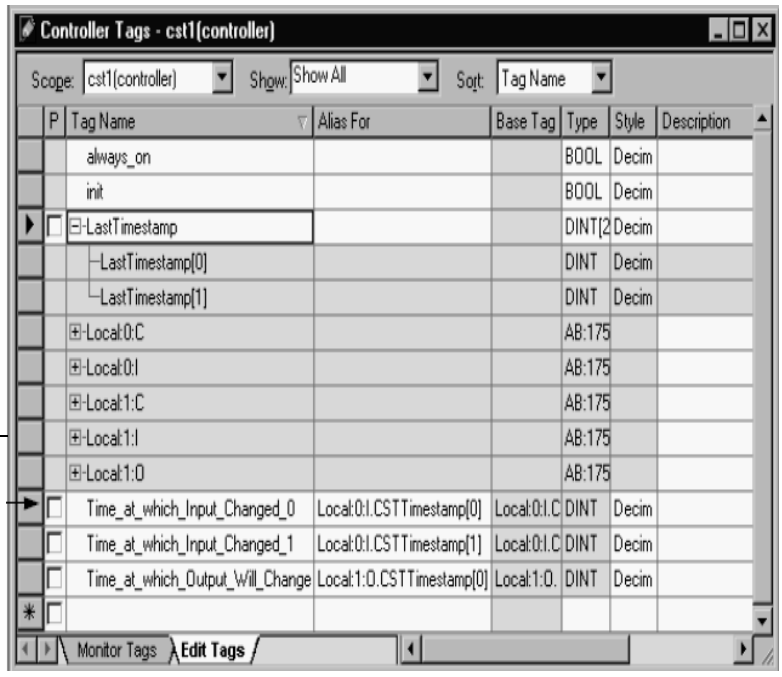
IMPORTANT Timestamps are eight bytes in size, two DINTS, but only the lower four bytes of the output timestamp (that is, Time_at_which_Ouput_Will_Change) are used to schedule the outputs into the future (to a max of 16.7 s or 16,700,000 µs.



- Rung 4 is the standard XIC-OTE rung that controls the output point based on the input point.

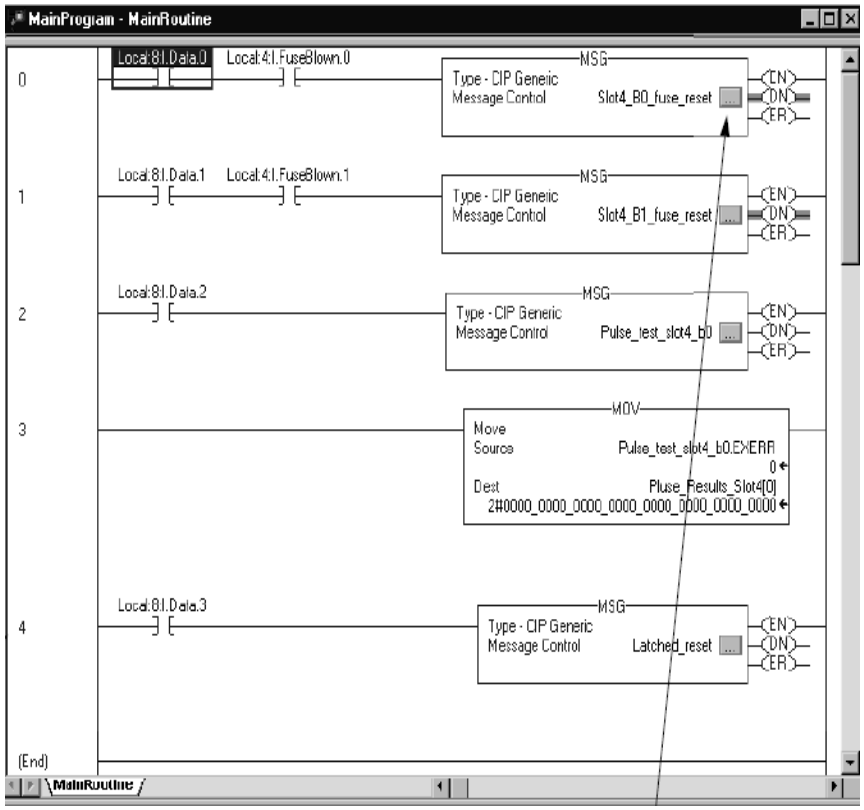
  The only difference is the output module is configured for scheduled outputs. The outputs will not get applied until the scheduled time has occurred.

  The Controller Tags dialog box shows examples of the tags created in the ladder logic, as displayed in the tag editor (bottom of the screen).



Reset a Fuse, Perform Pulse Test and Reset Latched Diagnostics

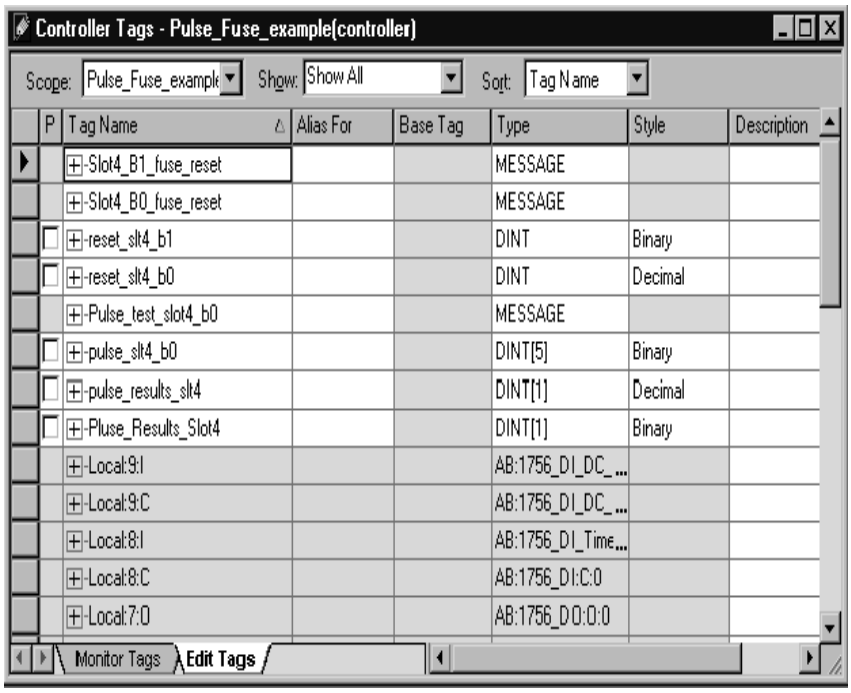
The following ladder logic program shows how to use ladder logic to reset the electronic fuse of a faulted point, perform a pulse test, and to reset latched diaganostics.



Click the box in each rung to see the associated configuration and communication.

- Rungs 0 and 1 are used to perform a reset fuse service on Bits 0 and 1, respectively. The example is of a 1756-OA8D module in slot 4.
- Rung 2 performs a pulse test service to slot 4.
- Rung 3 moves the results of the pulse test to a data storage location. (The actual results appear in the message instruction tags under the tag name EXERR).
- Rung 4 performs a reset latched diagnostics service to slot 4. This example shows an output module.

The Controller Tags dialog box shows examples of the tags created in the ladder logic, as displayed in the tag editor.



Perform a WHO to Retrieve Module Identification and Status

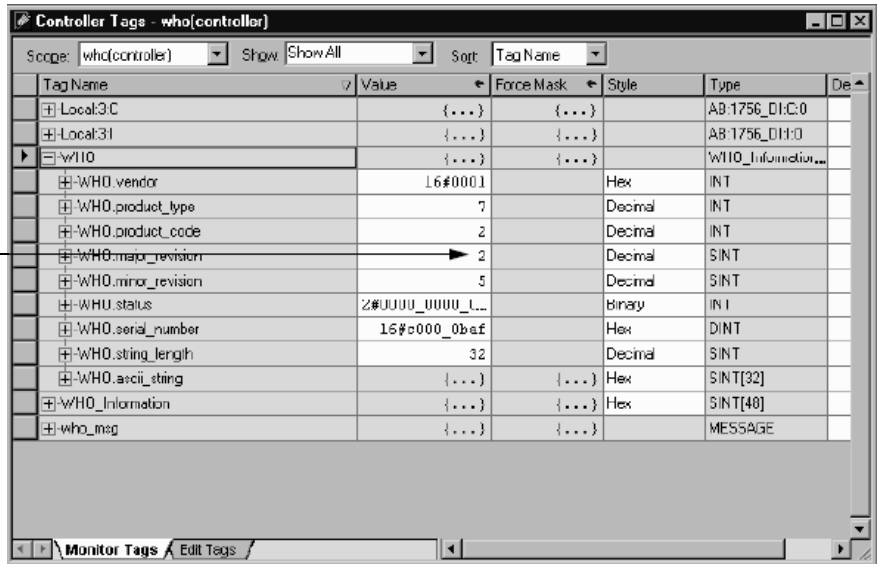
This ladder logic example shows how to retrieve module identification and status through a WHO service. In this application, a message instruction retrieves the following module identification information.

- Product type.
- Product code.
- Major revision.
- Minor revision.
- Status.
- Vendor.
- Serial number.
- String length.
- ASCII string.

A full explanation of each module identification category is provided after the ladder logic application.

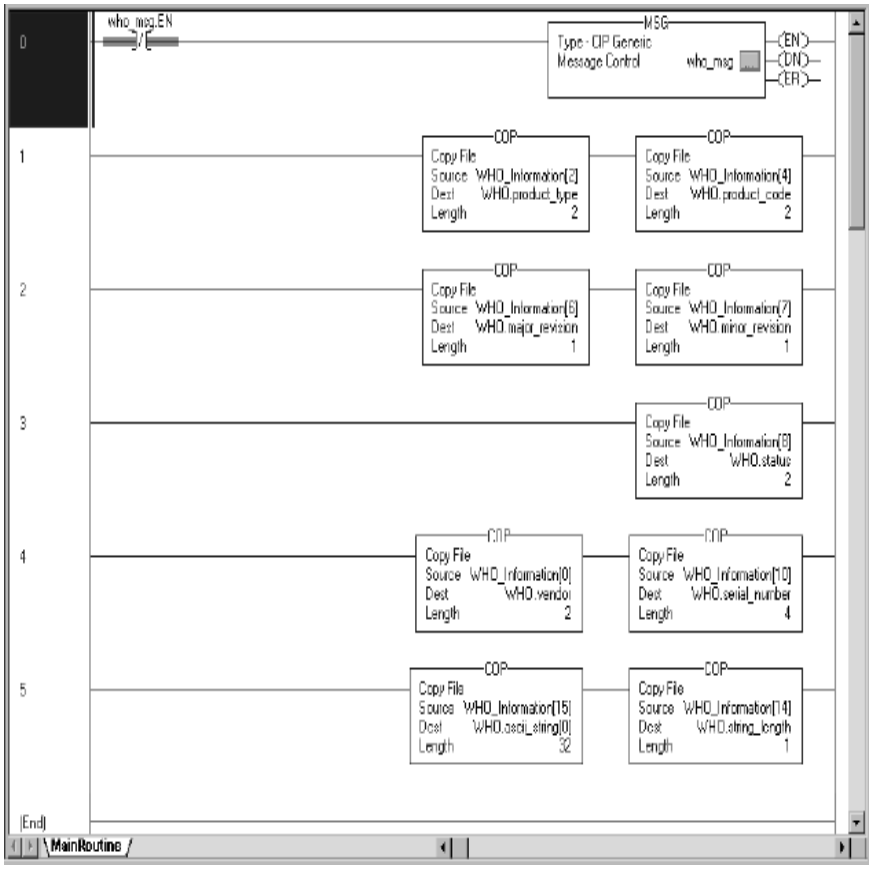
IMPORTANT The ladder logic example in this section uses a user-defined WHO data structure and a series of Copy instructions (following the Message instruction in the screen capture) to make the module identification information more easily understood.

The user-defined WHO data structure displays module identification information in an easily understood format. For example, the Controller Tags dialog box shows the module's major revision is 2.



You do not have to create the user-defined data structure. If you choose not to create this structure, you can use the ASCII string and String length to retrieve and understand module identification through some interface excluding RSLogix 5000 software.

The illustration shows an example WHO ladder logic application.



- Rung 0 constantly polls the module for WHO status. To conserve bandwidth, only poll for status when necessary.
- Rung 1 extracts the product type and catalog code.
- Rung 2 extracts the module's major and minor revisions.
- Rung 3 extracts the module's status information.
- Rung 4 extracts the vendor ID and serial number.
- Rung 5 extracts the module's ASCII text string and the length of the text string in bytes.

The table defines the values returned for each rung.

Rung	Module ID Retrieved	Description
1	Product Type	Module's product type, 7=Digital I/O, 10=Analog I/O
	Catalog Code	Module's catalog number
2	Major Revision	Module's major revision
	Minor Revision	Module's minor revision
3	Status	Module's status. Multiple bits listed. Bit 0: 0 = Unowned, 1 =Owned Bit 1: Reserved Bit 2: 0 = Unconfigured, 1 = Configured Bit 3: Reserved Bits 7-4: Forms a 4-bit number indicating Device Specific Status. 0 = Self-Test 1 = Flash update in progress 2 = Communications fault 3 = Not owned (outputs in Program mode) 4 = Unused 5 = Internal fault (need flash update) 6 = Run mode 7 = Program mode (output mods only) Bit 8: 0 = No fault, 1 = Minor recoverable fault Bit 9: 0 = No fault, 1 = Minor recoverable fault Bit 10: 0 = No fault, 1 = Minor recoverable fault Bit 11: 0 = No fault, 1 = Major unrecoverable fault Bits 15…12: Unused
4	Vendor ID	Module manufacturer vendor, 1 = Allen-Bradley
	Serial Number	Module serial number
5	Length of ASCII Text String	Number of characters in module's text string
	ASCII Text String	Module's ASCII text string description

Review of Tags in Ladder Logic

When you use tags in ladder logic applications, remember these guidelines.

- Ladder logic tags represent the module on a **point per bit basis**. For example, point 0 = bit 0 on the module.
- If you are **performing a service** through the tags, a value of 0 prevents the action from occurring, and a value of 1 causes the action to occur. For example, if you want to reset the electronic fuse on a particular bit, enter 1 in the tags.
- If you are checking the **response of a service** through the tags, a value of 0 means the bit passed the service, and a value of 1 means the bit failed the service. For example, if you perform a pulse test and the response displays a 0 for a particular bit, the bit passed the test.

Notes:

Choose Correct Power Supply

Power Sizing Chart

Use the chart to determine the power your ControlLogix chassis is using to prevent an inadequate power supply. We recommend that you use this worksheet to check the power supply of each ControlLogix chassis used.

Slot Number	Module Cat. No.	Current @ 5.1V DC (mA)		Power @ 5.1V DC (Watts)	Current @ 24 VDC (mA)		Power @ 24 VDC (Watts)	Current @ 3.3V DC (mA)		Power @ 3.3V DC (Watts)
0			x 5.1V =			x 24V =			x 3.3V =	
1			x 5.1V =			x 24V =			x 3.3V =	
2			x 5.1V =			x 24V =			x 3.3V =	
3			x 5.1V =			x 24V =			x 3.3V =	
4			x 5.1V =			x 24V =			x 3.3V =	
5			x 5.1V =			x 24V =			x 3.3V =	
6			x 5.1V =			x 24V =			x 3.3V =	
7			x 5.1V =			x 24V =			x 3.3V =	
8			x 5.1V =			x 24V =			x 3.3V =	
9			x 5.1V =			x 24V =			x 3.3V =	
10			x 5.1V =			x 24V =			x 3.3V =	
11			x 5.1V =			x 24V =			x 3.3V =	
12			x 5.1V =			x 24V =			x 3.3V =	
13			x 5.1V =			x 24V =			x 3.3V =	
14			x 5.1V =			x 24V =			x 3.3V =	
15			x 5.1V =			x 24V =			x 3.3V =	
16			x 5.1V =			x 24V =			x 3.3V =	
	TOTALS	mA		W (1)	mA		W (2)	mA		W (3)
		This number cannot exceed: 10000 mA for 1756-PA72, 1756-PB72 13000 mA for 1756-PA75, 1756PB75, 1756-PC75, 1756-PH75			This number cannot exceed 2800 mA			This number cannot exceed 4000 mA		
				These three wattage values (1, 2, 3), added together, cannot exceed: • 75 W @ 60 °C (140 °F) for any power supply						

Notes:

Motor Starters for Digital I/O Modules

Motor Starter Chart

This appendix provides data to help you choose a ControlLogix digital I/O module to drive Bulletin 500 series motor starters in your application. The tables list the number of motor starters (five sizes are listed for each module) that a particular digital I/O module can drive.

IMPORTANT When using the tables, remember that the supply voltage for each module must not drop below the minimum state motor starter supply voltage.

Maximum Allowed 2-3 Pole Motor Starters (120V AC/60 Hz)

Cat. No.	Motor Starters				
	Size 0…1	Size 2	Size 3	Size 4	Size 5
1756-OA16I	16	15 @ 30 °C (86 °F) 12 @ 60 °C (140 °F)	13 @ 30 °C (86 °F) 10 @ 60 °C (140 °F)	8 @ 30 °C (86 °F) 6 @ 60 °C (140 °F)	5 @ 30 °C (86 °F) 4 @ 60 °C (140 °F)
1756-OA16	16	14 (Only 7 per group)	4 (Only 2 per group)	None	None
1756-OA8	8	8	8	8 @ 30 °C (86 °F) 6 @ 60 °C (140 °F)	5 @ 30 °C (86 °F) 4 @ 60 °C (140 °F)
1756-OA8D	8	8	8	None	None
1756-OA8E	8	8	8	6 (Only 3 per group)	6 @ 30 °C (86 °F) (only 3 per group) 4 @ 60 °C (140 °F) (Only 2 per group)

Maximum Allowed 2-3 Pole Motor Starters (230V AC/60 Hz)

Cat. No.	Motor Starters				
	Size 0-1	Size 2	Size 3	Size 4	Size 5
1756-OA16I	16	16	16	16 @ 30 °C (86 °F) 13 @ 60 °C (140 °F)	11 @ 30 °C (86 °F) 9 @ 60 °C (140 °F)
1756-OA16‘	16	16	16	4 (Only 2 per group)	2 (Only 1 per group)
1756-OA8	8	8	8	8	8

Maximum Allowed 2-3 Pole Motor Starters (24V AC/60 Hz)

Cat. No.	Motor Starters				
	Size 0-1	Size 2	Size 3	Size 4	Size 5
1756-ON8	4 @ 30 °C (86 °F) 3 @ 60 °C (140 °F)	4 @ 30 °C (86 °F) 3 @ 60 °C (140 °F)	None	None	None

Determine the Maximum Number of Motor Starters

To determine the maximum number of motor starters that can be used by any 1756 digital I/O module, refer to this example.

Number of Motor Starters to be Used

Step	Value used in this example
1. Choose your motor starter	Allen-Bradley Bulletin 500 Size 3 120V AC/60 Hz/2-3 Poles. Inrush 1225VA, Sealed=45VA
2. Determine the number of motor starters required for your application	12 size 3 motor starters
3. Choose a ControlLogix digital output module	1756-OA16I • Output voltage = 74…265V AC • Output steady state current per point = 2A maximum @ 30 °C (86 °F) • & 1A maximum @ 60 °C (140 °F) Linear derating • Output steady state current per module = 5A maximum @ 30 °C (86 °F) & 4A maximum @ 60xC (linear derating) • Output surge current p= 20A maximum for 43 ms repeatable every 2 s @ 60 °C (140 °F)
4. Determine the maximum environmental operating temperature	50 °C (122 °F)
5. Confirm the voltage range is within the motor starter range	Motor starter uses 120V AC 1756-OA16I operates in a 74…120V AC voltage range

Number of Motor Starters to be Used

Step	Value used in this example
6. Confirm the inrush current per point	Inrush of motor starter - Line voltage = Inrush current = 1225VA/120V AC = 10.2 A Inrush
7. Confirm the steady state point current of the module can drive the motor starter	Sealed/Line voltage = Steady state current = 45VA/120V AC = 0.375 A @ 50 °C (122 °F) Output point current can drive: 2 A - (.033 mA x 10 °C) = 2 A - 0.33 A = 1.67 A @ 50 °C (122 °F) Above 30 °C (86 °F), output point derates to .033 mA/°C (point derating) The 1756-OA16I output point current (1.67A) can drive the motor starter (0.375 A @ 50 °C (122 °F)
8. Confirm the 1756-OA16I/A total module current can drive 12 size 3 motor starters @ 50 °C (122 °F)	Motor starter steady state current x 11 motor starters = .375 x 12 = 4.5A @ 50 °C (122 °F) The output total module current can drive: 5A - (.033 mA x 10 x C) = 5A -0.33 A =4.67 A @ 50 °C (122 °F) Above 30 °C (86 °F) total output current derates to .033 mA/x C (Module derating) The 1756-OA16I total output current (4.67A) can drive the 12 motor starters (4.5 A) @ 50 °C (122 °F)

Notes:

Major Revision Upgrades

Introduction

ControlLogix 1756 digital I/O modules are transitioning to use a new, internal backplane Application Specific Integrated Circuits (ASIC) chip. As a result, the module's Major Revision number has also been upgraded. Digital I/O modules with the new ASIC are identified at Major Revision 3.*x*.

IMPORTANT Do not backflash your module's firmware from firmware revision 3.*x* to 2.*x*. Attempting to backflash or downgrade a module's firmware from 3.*x* to 2.*x* will irreversibly damage the module.

You must return modules damaged by an attempt to backflash to firmware 2.*x* to Rockwell Automation.

Modules with the new internal backplane ASIC are form-fit, functional equivalents to the 2.*x* modules.

You can use Major Revision 3.*x* modules as direct replacements for Major Revision 2.*x* modules if:

- the electronic keying of the module is specified as Compatible or Disabled Keying.
- the electronic keying of the module is Exact Keying, then additional steps are required. See page 286 for details.

The use of the upgraded ASIC also impacts the firmware revisions that can be flash upgraded to the module. Digital I/O modules at Major Revision 3.*x* cannot be backflashed to any 2.*x* firmware revision. Digital I/O modules at firmware revision 2.*x* cannot be flash upgraded to any firmware revision 3.*x*.

If Using a Compatible or Disabled Keying I/O Configuration

If you are replacing a 2.*x* module with a 3.*x* module and have configured the 2.*x* module to use Compatible or Disabled Keying, further steps are not required.

If you use Compatible or Disabled Keying configurations, 3.*x* modules can be used as a direct replacements for 2.*x* modules.

If Using an Exact Match Keying Configuration

If you are currently using a 2.*x* module configured at Exact Match keying, consider changing the module's electronic keying in the I/O configuration to Compatible or Disabled Keying.

If you are replacing a 2.*x* module with a 3.*x* module and must use Exact Match keying in the I/O configuration, take additional action depending on your version of RSLogix 5000 software.

If you use Exact Match keying and	Then do this
RSLogix 5000 software, version 13 and later.	1. Delete the 2.*x* module from the I/O Configuration in the RSLogix 5000 software project. 2. Add a new 3.*x* revision module to the I/O configuration.
RSLogix 5000 software, version 12 and earlier.	Do one of the following: • Change the module's configuration to Disable Keying. • Upgrade RSLogix 5000 software to version 13 or later and complete the steps listed for RSLogix software, version 13 or later.

1492 IFMs for Digital I/O Modules

Cable Overview

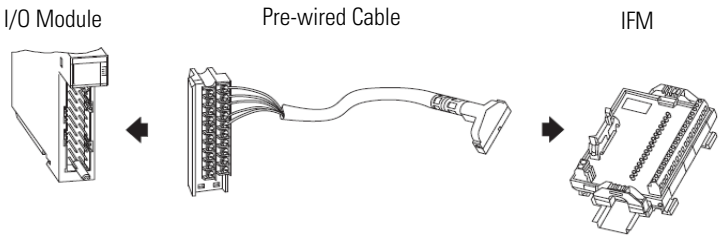
As an alternative to buying RTBs and connecting the wires yourself, you can buy a wiring system that connects to I/O modules through pre-wired and pre-tested cables.

IMPORTANT The ControlLogix system has been agency certified using only the ControlLogix RTBs (1756-TBCH, 1756-TBNH, 1756-TBSH and 1756-TBS6H). Any application that requires agency certification of the ControlLogix system using other wiring termination methods may require application specific approval by the certifying agency.

The combinations include the following:

- **Interface modules (IFMs)** mount on DIN rails to provide the output terminal blocks for the I/O module. Use the IFMs with the pre-wired cables that match the I/O module to the interface module.

  For a complete list of the IFMs available for use with ControlLogix digital I/O modules, see the table on page 289.

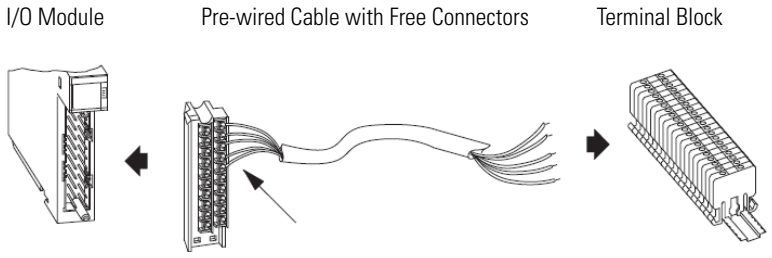


- **Pre-wired cables** are individually color-coded conductors that connect to a standard terminal block. The other end of the cable assembly is an RTB that plugs into the front of the I/O module. All of the pre-wired cables use 0.326 mm^2 (22 AWG) wire.

  For a complete list of the pre-wired cables available for use with ControlLogix digital I/O modules, see the table on page 302.

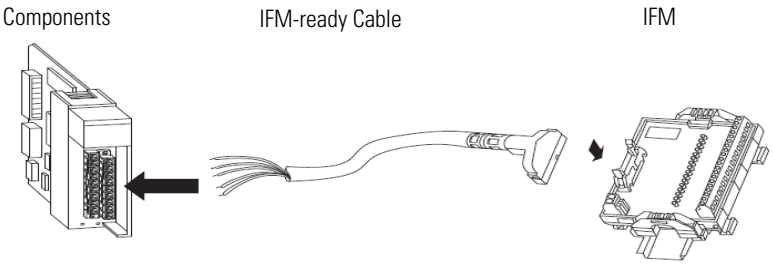
Additional pre-wired cable combinations include the following:

- **Digital I/O module-ready cables with free connectors** wire into standard terminal blocks or other type of connectors. The other end of the cable assembly is an RTB that plugs into the front of the I/O module.



  Most of the I/O module-ready cables use 0.823 mm^2 (18 AWG) conductors for higher current applications or longer cable runs.

- **IFM-ready cables** have a cable connection to attach to the IFM pre-wired to one end. The other end has free connectors to wire to I/O modules or other components.



  The IFM-ready cables use 0.326 mm^2 (22 AWG) wire.

The table lists the IFMs and pre-wired cables that can be used with ControlLogix digital I/O modules.

IMPORTANT For the latest list, see the Digital/Analog Programmable Controller Wiring Systems Technical Data, publication 1492-TD008.

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-IA8D	1492-IFM20F	Feed-through	Standard	1492-CABLExU (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20D120	Status-indicating	Standard with 120V AC/DC status indicators(1)	
	1492-IFM20D120N		Narrow standard with 120V AC status indicators	
	1492-IFM20D120A-2		120V AC with extra terminals for inputs	
	1492-IFM20F-FS120A-4	Fusible	Two 4-point isolated groups with four terminals per input and 120V AC/DC blown fuse indicators	
1756-IA16	1492-IFM20F	Feed-through	Standard	1492-CABLExX (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20F-3		3-wire sensor type input devices	
	1492-IFM20D120	Status-indicating	Standard with 120V AC/DC status indicators(1)	
	1492-IFM20D120N		Narrow standard with 120V AC status indicators	
	1492-IFM20D120A-2		120V AC with extra terminals for inputs	
	1492-IFM20F-F120A-2	Fusible	Extra terminals with 120V AC/DC blown fuse status indicators.	
1756-IA16I	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40DS120A-4	Fusible	Isolated with 120 V AC status indicators and four terminals per input	
	1492-IFM40F-FSA-4		Isolated 120V AC/DC with four terminals per input	
	1492-IFM40F-FS120A-4		Isolated with 120V AC/DC blown fuse indicators and four terminals per input.	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-IA32	1492-IFM40F	Feed-through	Standard	1492-CABLExZ (x=cable length)
	1492-IFM40F-2		Extra terminals	
	1492-IFM40D120A-2	Status-indicating	120V AC status indicators and extra terminals for inputs	
1756-IB16	1492-IFM20F	Feed-through	Standard	1492-CABLExX (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20F-3		3-wire sensor type input devices	
	1492-IFM20D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM20D24N		Narrow standard with 24V AC/DC status indicators	
	1492-IFM20D24A-2		24V AC/DC status indicators and extra terminals for inputs	
	1492-IFM20D24-3		3-wire sensor with 24V AC/DC status indicators	
	1492-IFM20F-F24A-2	Fusible	Extra terminals with 24V AC/DC blown fuse indicators for inputs	
1756-IB16D	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40F-2		Extra terminals	
	1492-IFM40DS24A-4	Status-indicating	Isolated with 24V AC/DC status indicators and four terminals per input	
	1492-IFM40F-F24AD-4	Fusible	Fused with 24V DC blown fuse low leakage indicators, four isolated groups and four terminals per input	
	1492-IFM40F-FS24A-4		Isolated with 24V AC/DC blown fuse indicators and four terminals per input[(2)]	
	1492-IFM40F-FSA-4		Isolated with 120V AC/DC with four terminals per input	
1756-IB16I	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40DS24A-4	Status-indicating	Isolated with 24V AC/DC status indicators and four terminals per input	
	1492-IFM40F-FS24A-4	Fusible	Isolated with 24V AC/DC blown fuse indicators and four terminals per input	
	1492-IFM40F-FSA-4		Isolated with 120V AC/DC with four terminals per input	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-IB32	1492-IFM40F	Feed-through	Standard	1492-CABLExZ (x=cable length)
	1492-IFM40F-2		Extra terminals	
	1492-IFM40F-3		3-wire sensor type input devices	
	1492-IFM40D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM40D24A-2		24V AC/DC status indicators and extra terminals for inputs	
	1492-IFM40D24-3		3-wire sensor with 24V AC/DC status indicators for inputs	
1756-IC16	1492-IFM20F	Feed-through	Standard	1492-CABLExX (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20F-3		3-wire sensor type input devices	
1756-IG16	N/A			
1756-IH16I	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40F-FSA-4	Fusible	Isolated with 120V AC/DC with four terminals per input	
	1492-IFM40F-FS120A-4		Isolated with 120V AC/DC blown fuse indicators with four terminals per input	
1756-IM16I	1492-IFM40DS240A-4	Status-indicating	Isolated with 240V AC status indicators and four terminals per input	1492-CABLExY (x=cable length)
	1492-IFM40F-FS240A-4	Fusible	Isolated with 240V AC/DC blown fuse indicators and four terminals per input	
1756-IN16	1492-IFM20F	Feed-through	Standard	1492-CABLExX (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20F-3		3-wire sensor type input devices	
	1492-IFM20D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM20D24N		Narrow standard with 24V AC/DC status indicators	
	1492-IFM20D24A-2		24V AC/DC status indicators and extra terminals for inputs	
	1492-IFM20D24-3		3-wire sensor with 24V AC/DC status indicators	
	1492-IFM20F-F24A-2	Fusible	Extra terminals with 24V AC/DC blown fuse indicators for inputs	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-IV16	1492-IFM20F	Feed-through	Standard	1492-CABLExX (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20F-3		3-wire sensor type input devices	
	1492-IFM20D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM20D24N		Narrow standard with 24V AC/DC status indicators	
	1492-IFM20D24A-2		24V AC/DC status indicators and extra terminals for inputs	
	1492-IFM20D24-3		3-wire sensor with 24V AC/DC status indicators	
1756-IV32	1492-IFM40F	Feed-through	Standard	1492-CABLExZ (x=cable length)
	1492-IFM40F-2		Extra terminals	
	1492-IFM40F-3		3-wire sensor type input devices	
	1492-IFM40D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM40D24A-2		24V AC/DC status indicators	
	1492-IFM20D24-2		24V AC/DC status indicators and extra terminals for inputs	
	1492-IFM20D24-3		3-wire sensor with 24V AC/DC status indicators	
1756-OA8	1492-IFM20F	Feed-through	Standard	1492-CABLExU (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20DS120-4	Status-indicating	Isolated with 120V AC status indicators and four terminals per output	1492-CABLExW (x=cable length)
	1492-IFM20F-FS-2	Fusible	Isolated with 120V AC/DC with extra terminals for outputs	
	1492-IFM20F-FS120-2		Isolated with extra terminals with 120V AC/DC blown fuse indicators for outputs	
	1492-IFM20F-FS120-4		Isolated with four terminals with 120V AC blown fuse indicators for outputs	
	1492-IFM20F-FS240-4		Isolated with four terminals with 240V AC/DC blown fuse indicators for outputs	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OA8D	1492-IFM20F	Feed-through	Standard	1492-CABLExU (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20DS120-4	Status-indicating	Isolated with 120V AC status indicators and four terminals per output	1492-CABLExV (x=cable length)
	1492-IFM20F-FS-2	Fusible	Isolated 120V AC/DC with extra terminals for outputs	
	1492-IFM20F-FS120-2		Isolated with extra terminals with 120V AC/DC blown fuse indicators	
	1492-IFM20F-FS120-4		Isolated with four terminals per output and 120V AC/DC blown fuse indicators	
1756-OA8E	1492-IFM20F	Feed-through	Standard	1492-CABLExU (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20DS120-4	Status-indicating	Isolated with 120V AC status indicators and four terminals per output	1492-CABLExV (x=cable length)
	1492-IFM20F-FS-2	Fusible	Isolated 120V AC/DC with extra terminals for outputs	
	1492-IFM20F-FS120-2		Isolated with extra terminals with 120V AC/DC blown fuse indicators	
	1492-IFM20F-FS120-4		Isolated with four terminals per output and 120V AC/DC blown fuse indicators	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OA16	1492-IFM20F	Feed-through	Standard	1492-CABLExX (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20D120N	Status-indicating	Narrow standard with 120V AC status indicators	
	1492-IFM20D120-2		120V AC/DC status indicators and extra terminals for outputs	
	1492-IFM20F-F2	Fusible	Extra terminals for outputs	
	1492-IFM20F-F120-2		Extra terminals with 120V AC blown fuse indicators for outputs	
	1492-IFM20F-F240-2		Extra terminals with 240V AC blown fuse indicators for outputs	
	1492-XIM20120-8R	Relay Master	20-pin master with eight, 24V DC relays[3]	
	1492-XIM20120-16R		20-pin master with sixteen, 120V AC relays	
	1492-XIM20120-16RF		20-pin master with sixteen, 120V AC relays with fusing	
	1492-XIM120-8R	Relay Expander	Expander with eight, 120V AC relays[4]	
	1492-XIMF-F120-2	Fusible Expander	Expander with eight, 120V channels with blown fuse indicators[4]	
	1492-XIMF-2	Feed-through Expander	Expander with eight feed-through channels[4]	
1756-OA16I	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40DS120-4	Status-indicating	Isolated with 120V AC status indicators and four terminals per output	
	1492-IFM40-FS-2	Fusible	Isolated with extra terminals for outputs	
	1492-IFM40-FS-4		Isolated 240V AC/DC with four terminals per output	
	1492-IFM40F-FS120-2		Isolated with extra terminals and 120V AC/DC blown fuse indicators	
	1492-IFM40F-FS120-4		Isolated with 120V AC/DC blown fuse indicators and four terminals per output	
	1492-IFM40F-FS240-4		Isolated with 240V AC/DC blown fuse indicators and four terminals per output	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OB8	1492-IFM20F	Feed-through	Standard	1492-CABLExU (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IMF20F-2		Extra terminals	
	1492-IFM20DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output	1492-CABLExW (x=cable length)
	1492-IFM20F-FS-2	Fusible	Isolated 120V AC/DC with extra terminals for outputs	
	1492-IFM20F-FS24-2		Isolated with extra terminals per output and 24V AC/DC blown fuse indicators	
1756-OB8EI	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output	
	1492-IFM40F-FS-2	Fusible	Isolated with extra terminals for 120V AC/DC outputs	
	1492-IFM40F-FS24-2		Isolated with extra terminals and 24V AC/DC blown fuse indicators for outputs	
	1492-IFM40F-FS24-4		Isolated with 24V AC/DC blown fuse indicators and four terminals per output	
	1492-IFM40F-FS-4		Isolated 240V AC/DC with four terminals per output	
1756-OB8I	N/A			

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OB16D	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40F-2		Extra terminals	
	1492-IFM40DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output(5)	
	1492-IFM40F-F24D-2	Fusible	Fused with 24V DC blown fuse low leakage status indicator circuit with four isolated groups and four terminals per output	
	1492-IFM40F-FS-2		Isolated with extra terminals for 120V AC/DC outputs	
	1492-IFM40F-FS24-2		Isolated with extra terminals and 24V AC/DC blown fuse indicators for outputs(6)	
	1492-IFM40F-FS24-4		Isolated with extra terminals and 24V AC/DC blown fuse indicators and four terminals per output(6)	
	1492-IFM40F-FS-4		Isolated 240V AC/DC with four terminals per output	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OB16E	1492-IFM20F	Feed-through	Standard	1492-CABLExX (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM20D24N		Narrow standard with 24V AC/DC status indicators	
	1492-IFM20D24-2		24V AC/DC status indicators and extra terminals for outputs	
	1492-IFM20F-F2	Fusible	120V AC/DC with extra terminals for outputs	
	1492-IFM20F-F24-2		Extra terminals with 24V AC/DC blown fuse indicators	
	1492-XIM2024-8R	Relay Master	20-pin master with eight, 24V DC relays[7]	
	1492-XIM2024-16R		20-pin master with sixteen, 24V DC relays	
	1492-XIM2024-16RF		20-pin master with sixteen, 24V DC relays with fusing	
	1492-XIM24-8R	Relay Expander	Expander with eight, 24V DC relays[4]	
	1492-XIMF-F24-2	Fusible Expander	Expander with eight, 24V channels with blown fuse indicators[4]	
	1492-XIMF-2	Feed-through Expander	Expander with eight feed-through channels[4]	
1756-OB16I	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output	
	1492-IFM40F-FS-2	Fusible	Isolated with extra terminals for 120V AC/DC outputs[8]	
	1492-IFM40F-FS24-2		Isolated with extra terminals and 24V AC/DC blown fuse indicators for outputs[8]	
	1492-IMF40F-FS24-4		Isolated with 24V AC/DC blown fuse indicators and four terminals per output[8]	
	1492-IFM40F-FS-4		Isolated with 240V AC/DC and four terminals per output[8]	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OB16IS	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output	
	1492-IFM40F-FS-2	Fusible	Isolated with extra terminals for 120V AC/DC outputs(8)	
	1492-IFM40F-FS24-2		Isolated with extra terminals and 24V AC/DC blown fuse indicators for outputs(8)	
	1492-IMF40F-FS24-4		Isolated with 24V AC/DC blown fuse indicators and four terminals per output(8)	
	1492-IFM40F-FS-4		Isolated with 240V AC/DC and four terminals per output(8)	
1756-OB32	1492-IFM40F	Feed-through	Standard	1492-CABLExZ (x=cable length)
	1492-IFM40F-2		Extra terminals	
	1492-IFM40D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM40D24-2		24V AC/DC status indicators and extra terminals for outputs	
	1492-IFM40F-F2	Fusible	120V AC/DC with extra terminals for outputs	
	1492-IFM40F-F24-2		Extra terminals with 24V AC/DC blown fuse indicators for outputs	
	1492-XIM4024-8R	Relay Master	40-pin master with eight, 24V DC relays	
	1492-XIM4024-16R		40-pin master with sixteen, 24V DC relays	
	1492-XIM4024-16RF		40-pin master with sixteen, 24V DC relays with fusing	
	1492-XIM24-8R	Relay Expander	Expander with eight, 24V DC relays(4)	
	1492-XIMF-F24-2	Fusible Expander	Eight-channel expander with 24V AC blown fuse indicators(4)	
	1492-XIM24-16RF		Expander with sixteen, 24V DC relays with fusing(9)	
	1492-XIMF-2	Feed-through Expander	Expander with eight feed-through channels(4)	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OC8	1492-IFM20F	Feed-through	Standard	1492-CABLExU (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output	1492-CABLExW (x=cable length)
	1492-IFM20F-FS2	Fusible	Isolated 120V AC/DC with extra terminals for outputs	
	1492-IFM20F-FS24-2		Isolated with extra terminals per output and 24V AC/DC blown fuse indicators	
1756-OG16	N/A			
1756-OH8I	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40F-FS-2	Fusible	Isolated with extra terminals for 120V AC/DC outputs	
	1492-IFM40F-FS120-2		Isolated with extra terminals and 120V AC/DC blown fuse indicators	
1756-ON8	1492-IFM20F	Feed-through	Standard	1492-CABLExU (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output	1492-CABLExW (x=cable length)
	1492-IFM20F-FS2	Fusible	Isolated 120V AC/DC with extra terminals for output	
	1492-IFM20F-FS24-2		Isolated with extra terminals per output and 24V AC/DC blown fuse indicators	
1756-OV16E	1492-IFM20F	Feed-through	Standard	1492-CABLExX (x=cable length)
	1492-IFM20FN		Narrow standard	
	1492-IFM20F-2		Extra terminals	
	1492-IFM20D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM20D24-2		24V AC/DC status indicators and extra terminals for outputs	
	1492-IFM20F-F2	Fusible	120V AC/DC with extra terminals for outputs	
	1492-IFM20F-F24-2		Extra terminals with 24V AC/DC blown fuse indicators	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OV32E	1492-IFM40F	Feed-through	Standard	1492-CABLExZ (x=cable length)
	1492-IFM40F-2		Extra terminals	
	1492-IFM40D24	Status-indicating	Standard with 24V AC/DC status indicators	
	1492-IFM40D24-2		24V AC/DC status indicators and extra terminals for outputs	
	1492-IFM40F-F2	Fusible	120V AC/DC with extra terminals for outputs	
	1492-IFM40F-F24-2		Extra terminals with 24V AC/DC blown fuse indicators for outputs	
1756-OW16I	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output	
	1492-IFM40DS120-4		Isolated with 120V AC status indicators and four terminals per output	
	1492-IFM40F-FS-2	Fusible	Isolated with extra terminals for 120V AC/DC outputs	
	1492-IFM40F-FS24-2		Isolated with extra terminals and 24V AC/DC blown fuse indicators for outputs	
	1492-IMF40F-FS24-4		Isolated with 24V AC/DC blown fuse indicators and four terminals per output	
	1492-IFM40F-FS-4		Isolated 240V AC/DC with four terminals per output	
	1492-IMF40F-FS120-2		Isolated with extra terminals and 120V AC blown fuse indicators	
	1492-IMF40F-FS120-4		Isolated with 120V AC/DC blown fuse indicators and four terminals per output	
	1492-IMF40F-FS240-4		Isolated with 240V AC/DC blown fuse indicators and four terminals per output	

I/O Cat. No.	IFM Cat. No.	IFM Type	IFM Description	Pre-wired Cable
1756-OX8I	1492-IFM40F	Feed-through	Standard	1492-CABLExY (x=cable length)
	1492-IFM40DS24-4	Status-indicating	Isolated with 24/48V AC/DC status indicators and four terminals per output	
	1492-IFM40DS120-4		Isolated with 120V AC status indicators and four terminals per output	
	1492-IFM40F-FS-2	Fusible	Isolated with extra terminals for 120V AC/DC outputs	
	1492-IFM40F-FS24-2		Isolated with extra terminals and 24V AC/DC blown fuse indicators for outputs	
	1492-IMF40F-FS24-4		Isolated with 24V AC/DC blown fuse indicators and four terminals per output	
	1492-IFM40F-FS-4		Isolated 240V AC/DC with four terminals per output	
	1492-IMF40F-FS120-2		Isolated with extra terminals and 120V AC blown fuse indicators	
	1492-IMF40F-FS120-4		Isolated with 120V AC/DC blown fuse indicators and four terminals per output	
	1492-IMF40F-FS240-4		Isolated with 240V AC/DC blown fuse indicators and four terminals per output	

(1) This IFM is not recommended for use with I/O modules that have an off-state leakage current exceeding 0.5 mA. Use a 1492-IFM20D120N or 1492-IFM20D120A-2 module for inputs. Use a 1492-IFM20D120-2 module for outputs.

(2) The 1492-IFM40F-FS24A-4 module and the 1492-CABLExY cable can be used with the 1756-IB16D module. However, due to the 1492-IFM40F-FS24A-4 module's blown fuse leakage current rating, the 'wire off' diagnostic function of the 1756-IB16D module will not indicate a blown or removed fuse as a wire off condition. If you require this diagnostic to function for a blown or removed fuse, you must use a 1492-IFM40F-F24AD-4 module.

(3) Expandable to 16 by using a XIM120-BR or XIMF-24-2 module.

(4) Can have up to 1 expandable module depending upon master used (total 16 pts or less). Extender cable is provided.

(5) IFMs status indicator provides output On/Off indication. Due to the magnitude of current through the status indicator, the 1756-OB16D module 'no load' diagnostic function will not work. If this function is required, use the 1492-IFM40F-2 module.

(6) The 1492-IFM40F-FS24-2 and 1492-IFM40F-FS24-4 modules and the 1492-CABLExY cable can be used with the 1756-OB16D module. However, due to the 1492-IFM40F-FS24-2 and 1492-IFM40F-FS24-4 module's blown fuse leakage current rating, the 'no load' diagnostic function of the 1756-OB16D module will not indicate a blown or removed fuse as a no load condition. If you require this diagnostic to function for a blown or removed fuse, you must use a 1492-IFM40F-F24D-2 module.

(7) Expandable to 16 by using a XIM24-8R or XIMF-24-2 module.

(8) Do not use this module in Output Sinking mode with fused IFM modules, as the IFM module fuses will not properly protect the circuit.

(9) One 1492-XIM24-16RF module is to be used with one 1492-XIM4024-16R or 1492-XIM4024-16RF master (32 pt. only).

The following tables describe the I/O module-ready, pre-wired cables available for use with your ControlLogix digital I/O modules.

Cat. No.[1]	No. of Conductors	Conductor Size	Nominal Outer Diameter	RTB at the I/O Module End
1492-CABLExU	20	0.326 mm^2 (22 AWG)	9.0 mm (0.36 in.)	1756-TBNH
1492-CABLExV				
1492-CABLExW				
1492-CABLExX				
1492-CABLExY	40		11.7 mm (0.46 in.)	1756-TBCH
1492-CABLExZ				

(1) Cables are available in lengths of 0.5 m, 1.0 m, 2.5 m, and 5.0 m. To order, insert the code for the desired cable length into the catalog number in place of the x: 005=0.5 m, 010=1.0 m, 025=2.5 m, 050=5 m. Build-to-order cable lengths are also available.

Cat. No.[1]	No. of Conductors	Conductor Size	Nominal Outer Diameter	RTB at the I/O Module End
1492-CABLExTBNH	20	0.823 mm^2 (18 AWG)	11.4 mm (0.45 in.)	1756-TBNH
1492-CABLExTBCH	40[2]		14.1 mm (0.55 in.)	1756-TBCH

(1) Cables are available in lengths of 0.5 m, 1.0 m, 2.5 m, and 5.0 m. To order, insert the code for the desired cable length into the catalog number in place of the x: 005=0.5 m, 010=1.0 m, 25=2.5 m, 050=5 m. Build-to-order cable lengths are also available.

(2) Four conductors are not connected to the RTB.

broadcast

Data transmissions to all addresses or functions.

change of state (COS)

Any change in the ON or OFF state of a point on an I/O module.

communication format

Format that defines the type of information transferred between an I/O module and its owner-controller. This format also defines the tags created for each I/O module.

compatible match

An electronic keying protection mode that requires that the physical module and the module configured in the software to match according to vendor and catalog number. In this case, the minor revision of the module must be greater than or equal to that of the configured slot.

connection

The communication mechanism from the controller to another module in the control system.

coordinated system time (CST)

Timer value which is kept synchronized for all modules within a single ControlBus chassis.

direct connection

An I/O connection where the controller establishes an individual connection with I/O modules.

disable keying

An electronic keying protection mode that requires no attributes of the physical module and the module configured in the software to match.

download

The process of transferring the contents of a project on the workstation into the controller.

electronic keying

A feature where modules can be requested to perform an electronic check to make sure that the physical module is consistent with what was configured by the software.

exact match

An electronic keying protection mode that requires the physical module and the module configured in the software to match according to vendor, catalog number, major revision and minor revision.

field side

Interface between user field wiring and I/O module.

inhibit

A ControlLogix process that lets you configure an I/O module but prevent it from communicating with the owner-controller. In this case, the controller behaves as if the I/O module does not exist at all.

interface module (IFM)

A module that uses pre-wired cable to connect wiring to an I/O module.

listen-only connection

An I/O connection where another controller owns/provides the configuration and data for the module.

major revision

A module revision that is updated any time there is a functional change to the module.

minor revision

A module revision that is updated any time there is a change to the module that does not affect its function or interface.

multicast

Data transmissions that reach a specific group of one or more destinations.

multiple owners

A configuration set-up where multiple owner-controllers use exactly the same configuration information to simultaneously own an input module.

network update time (NUT)

The smallest repetitive time interval in which the data can be sent on a ControlNet network. The NUT ranges from 2 ms to 100 ms.

owner-controller

The controller that creates and stores the primary configuration and communication connection to a module.

program mode

In this mode the following events occur:

- Controller program is not executing.
- Inputs are still actively producing data.
- Outputs are not actively controlled and go to their configured Program mode.

rack connection

An I/O connection where the 1756-CNB module collects digital I/O words into a rack image to conserve ControlNet connections and bandwidth.

rack optimization

A communication format in which the 1756-CNB module collects all digital I/O words in the remote chassis and sends them to controller as a single rack image.

remote connection

An I/O connection where the controller establishes an individual connection with I/O modules in a remote chassis.

removal and insertion under power (RIUP)

ControlLogix feature that allows a user to install or remove a module or RTB while power is applied.

removable terminal block (RTB)

Field wiring connector for I/O modules.

requested packet interval (RPI)

The maximum amount of time between broadcasts of I/O data.

run mode

In this mode, the following events occur:

- Controller program is executing
- Inputs are actively producing data
- Outputs are actively controlled

service

A system feature that is performed on user demand, such as fuse reset or diagnostic latch reset.

system side

Backplane side of the interface to the I/O module.

tag

A named area of the controller's memory where data is stored.

timestamping

A ControlLogix process that stamps a change in input data with a relative time reference of when that change occurred.

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